Annual Review and Planning Framework for Telecommunications in the Government of Canada 1984

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Government of Canada
Department of Communications

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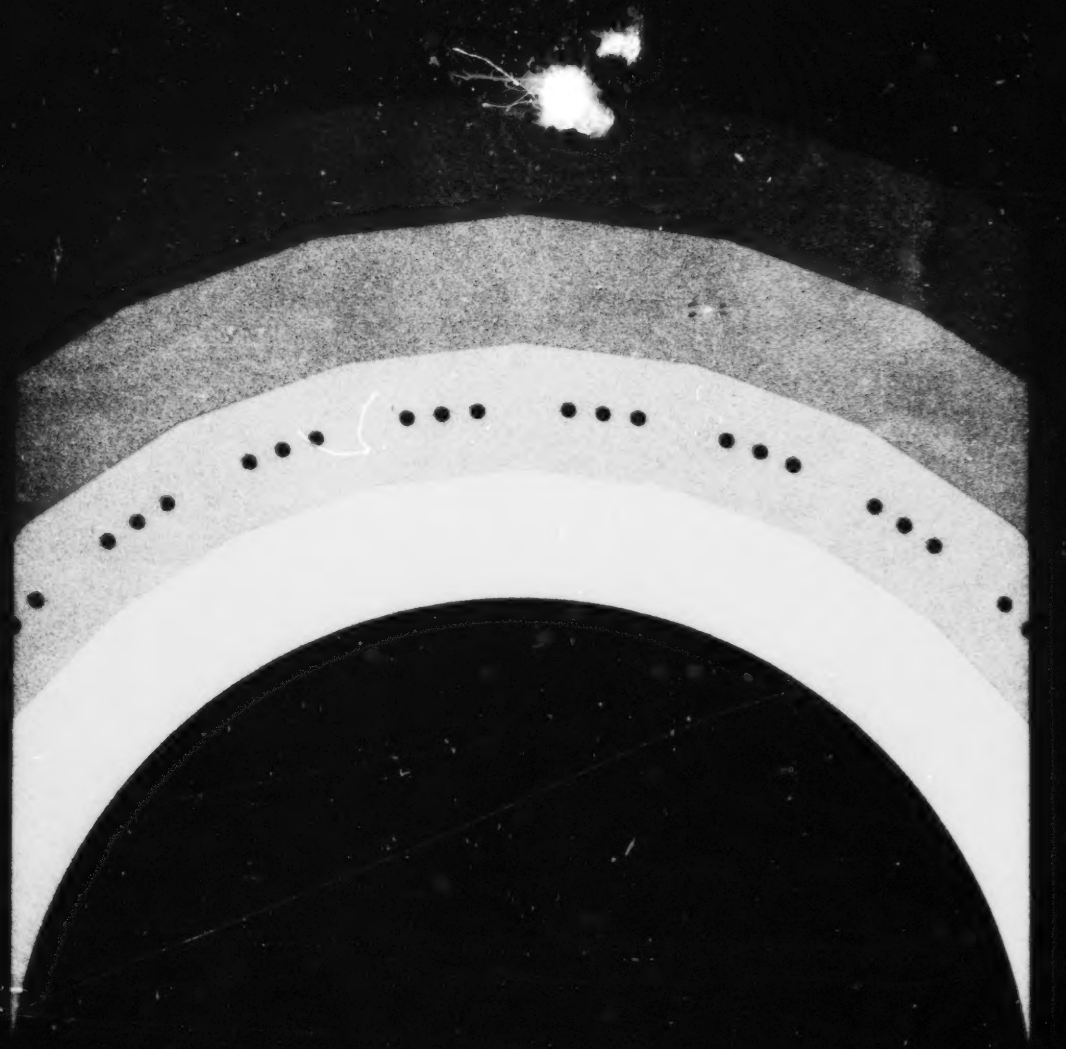
Ministère des Communications



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ANNUAL REVIEW AND PLANNING FRAMEWORK FOR TELECOMMUNICATIONS IN THE GOVERNMENT OF CANADA 1984

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EDITORIAL NOTE

The Annual Review of Telecommunications in the Government of Canada was first published in 1976/77, followed by successive yearly publications through 1981/82. Subsequent to the issuance of the 1981/82 Annual Review, however, an attempt to improve government telecommunications planning resulted in a shift of the reporting deadline required by Treasury Board from October to February. A gap was therefore created between the publication labelled 1981/82 and this 1984 Annual Review and Planning Framework.

With the exception of the English version of the 1979/80 issue, limited copies of the back issues are available upon request from the Planning and Co-ordination Division of the Government Telecommunications Agency, Department of Communications (DOC).

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Table of Contents

		Page
A.	**Introduction**	1
B.	**Highlights**	2
C.	**Convergence**	4
1.	Definitions	4
2.	The technologies	5
3.	The means	5
	3.1 Convergence of the means	6
	3.1.1 The EDP variable	6
	3.1.2 The office equipment variable	7
	3.1.3 The telecommunications variable	7
4.	The requirement	8
5.	The ends	9
	5.1 The people	9
	5.2 The management	10
	5.3 The organization	11
D.	**Review of fiscal year 1982/1983**	12
1.	Information Technology and Systems Plan	12
	1.1 Procedure	12
	1.2 Coverage	12
2.	Financial analysis	13
	2.1 Total telecommunications expenditures (Tables 1 and 2)	13
	2.2 Telecommunications operating expenditures (Table 1)	14

Page

2.3 Telecommunications capital expenditures (Table 1) 14
2.4 Telecommunications personnel and related expenditures (Tables 1 and 3) 15
2.5 Shared, customized and departmental services (Table 4) 15

3. Government Telecommunications Agency charges 16
3.1 Government Telecommunications Agency revenues (Table 5) 16
3.2 Government Telecommunications Agency operating expenditures 16
3.3 Government Telecommunications Agency administration expenditures 16
3.4 Comparison of costs of government inter-city (IX) network and public long distance network 17
3.5 GTA services utilization (Table 6) 17

4. Future 18
4.1 Forecast of expenditures and personnel (Tables 7 and 8) 18
4.2 Future developments 19

E. Long-range planning framework 30

1. Introduction 30

2. Government objectives and priorities 30

3. Carriers and industry 31

4. Environmental factors 34
4.1 Legislation, regulations and standards 34
4.1.1 Legislation 34
4.1.2 Regulations 35
4.1.3 Standards 38
4.2 Socio-economic factors 38
4.2.1 Labour 39
4.2.2 Workplace 40
4.2.3 Economy 41
4.3 Technologies 42
4.3.1 Identification 43
4.3.2 Demand measurements 44
4.4 Government Research and Development (R&D) 49
4.4.1 University research 50

Page

4.4.2 Office Communications Systems (OCS) field trials 51
4.4.3 Mobile Satellite (MSAT) 54
4.4.4 Optical communications and electro-optics 56

5. Administrative practices 57
5.1 Update 59
5.1.1 Practices on consolidations 59
5.1.2 The Telecommunications Management Manual (TMM) 59
5.2 Projected requirements 60
5.2.1 Long-term problem 60
5.2.2 Conceptual solution 60
5.2.3 Organizational change 60
5.2.4 Proposed management principles 62
5.2.5 Changes to promulgation mechanisms 62
5.2.6 Training 63

6. Planning activities 63
6.1 Departments and agencies 64
6.1.1 Planning objective 64
6.1.2 Mechanism 64
6.1.3 Summary report 64
6.2 Government Telecommunications Agency (GTA) 66
6.2.1 Planning objective 66
6.2.2 Mechanism 66
6.2.3 Summary report 66
6.3 Telecommunications Advisory Committee (TAC) 68
6.3.1 Planning objective 68
6.3.2 Mechanism 68
6.3.3 Summary report 68

7. Concluding observations 69

Tables, graphs and figures

Table

1 Telecommunications expenditures by category 20

2 Total telecom expenditures (including salaries) 21

3 Telecommunications personnel 1982/83 22

Page

4 Shared, customized and departmental services - % of total 23

5 GTA revenues 1981/82 - 1982/83 24

6 Breakdown of operating telecommunications expenditures for 1981/82 and 1982/83 25

7 Telecommunications expenditures and person-year forecast 26

8 Summary of forecasts for total telecommunications expenditures 27

Graph

1 Telecommunications expenditures forecast 28

2 Percentage public service telecommunications personnel employed in various areas of activity 1982/83 29

Figure

1 Basic + enhanced services public switched network 45

2 Hybrid linear network (32 Ports) 58

F. Appendixes

I A study on employment effects

II A case study in planning

III A case study in the electronic office

IV Reading guide

V Glossary of abbreviations

A. Introduction

The Treasury Board Administrative Policy Manual (Chapter 435), requires that an Annual Review of Telecommunications be prepared by DOC in consultation with the Telecommunications Advisory Committee (TAC). It is developed on the basis of departmental submissions, with timing and content determined by Treasury Board in consultation with DOC.

The purpose of the Annual Review is to improve the management and administration of telecommunications in the government. To assist departments in the planning process, a planning framework is included in the format. This year the title has been amended to reflect an increasing emphasis on planning in the content.

While the Annual Review and Planning Framework represents one vehicle whereby planning information reaches departments, it should be noted that telecommunications planning is continually bolstered by various less visible pro-active exchanges within the community.

B. Highlights

1. Focus

For the past few years telecommunications has been on a path of convergence with the electronic data processing and office equipment technologies. This issue of the Annual Review and Planning Framework focuses on that convergence, beginning with a dissertation on its history, present status and emerging managerial problems. The long-range planning framework together with Appendixes I, II and III provide information intended to help managers understand issues related to convergence and plan telecommunications in light of the information technology with which they are dealing.

2. Telecommunications expenditures

Fifty-eight government departments reported to Treasury Board total expenditures of $496 million on telecommunications in 1982/83. Analysis shows that, of those, the capital component constituted the largest relative increase over the previous year. This was not surprising, as capital expenditures (departmental by nature) are characterized by sizable biennial rises. The overall effect, however, tends to reduce the proportion of shared and customized expenditures. The largest single component, of course, is operations, where the increase was significantly less than in 1981/82.

Total expenditures, including those personnel-related, are forecast to continue to rise through 1987/88, but at a lower rate per year than that experienced in 1982/83.

Further details, including a forecast of future expenditures and personnel, are provided in Section D.

3. Long-range planning framework

Government objectives and priorities are coupled with observations of environmental and industrial trends and reports of administrative practices, research and planning activities to form the long-range planning framework.

Some noteworthy trends include the following:

> The information technology industries are becoming increasingly communications-oriented. Voice processing looms as the single most important development in the provision of integrated information technology.
>
> Sectors experiencing major growth in the short term will be the software and data service industries.

A multiplicity of enhanced services is in the offing, including the integration of both voice and facsimile with electronic messaging service by 1990. Use of voice messaging is on the increase.

As data terminals, word processors and personal computers become less distinguishable one from another, multi-functional workstations are taking their place. By 1992 these workstations will be able to inter-operate with a wide variety of networks and will function as "personal assistants" to middle and senior managers.

A proliferation of data bases is anticipated; extent and depth of coverage will be augmented.

The per-unit cost of most of the components of information technology is going down. For this reason it is now increasingly cost-beneficial to apply the technology to the solution of more and more office functions.

In the long range, government shared services will be provided over a Government Integrated Services Network in accordance with public switched network developments.

Both circuit- and packet-switched data communications services will be offered on a shared basis.

Research efforts on Fibre Optic Local Area Networks (FO-LANs) and optoelectronic switch arrays promise high-capacity benefits.

Organization of work and workplace is required to best equip departments and agencies to take maximum advantage of the new tools available.

These and other trends and developments are reported in more detail in Section E.

C. Convergence

The word "convergence" has found a niche in modern literature under a complexity of connotations. Max Lerner, in his foreword to The Aquarian Conspiracy, describes "an American renaissance" taking place in terms of a universal convergence of disciplines, while philosopher and author E.F. Schumacher, in A Guide for the Perplexed, writes of convergent and divergent problems.

Convergence in the sense that interests the telecommunications community involves a variety of both disciplines and problems. These are explored in the form of an overview in this section and as a preface to the planning framework - a more detailed examination of the divergent progeny to which convergence is parent.

1. Definitions

Information technology is defined as "the acquisition, processing, storage and dissemination of vocal, pictorial, textual and numerical information by means of computers and telecommunications."* Obviously, such a technology should be, and often is, found in the office. Hence the expression "Office of the Future," and now "electronic office," is used to describe "a technologically feasible office environment which makes maximum, or optimum, use of information technology."*

In the Information Technology and Systems Plan instructions the term "Informatics" is used as a synonym for Information Technology and is defined to include the primary technologies of traditional electronic data processing, telecommunications and emerging electronic office systems, and the technologies associated with their convergence and interconnection.

The term "convergence" is often used to describe the coming together of technologies that in the past have been regarded as relatively distinct. In the context of this report, however, convergence refers to computers, telecommunications and office systems being linked together to provide the integrated electronic office **in support of the knowledge worker**.

The approach proposed to examine this phenomenon involves dissecting each of the elements - that is, the three technologies (the means) and the knowledge worker's needs (the ends) - summarizing the requirements of the problem, and identifying the organizational and human dimensions affected by convergence.

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*A.J. Meadows, M. Gordon, G. Singleton, Dictionary of New Information Technology, (New York: Kogan Page, London Nichols Publishing Co., 1982).

2. The technologies

The profile of the office is being re-shaped by the three technologies fundamental to its functions: office equipment, Electronic Data Processing (EDP) and telecommunications. It is no longer certain, however, that this is the way it should take place. It might be more appropriate for the office worker (knowledge worker) to reshape its environment using the technologies. As someone once put it, "Office automation is the answer; now, what is the question?"

3. The means

In his brief to the Royal Commission on the Economic Union and Development Prospects for Canada, published in November, 1983, the Minister of Communications explained how the telecommunications and computer technologies are integrating:

> "In a scientific sense the integration of these technologies results from a pair of related developments. First, telecommunications and computers are beginning to speak the same language: digital. Every kind of information, no matter what its source or nature, can be encoded in digital form. This means that in principle all information can be transformed into machine language, transmitted over long distances without loss of fidelity, processed into new forms and translated back into pictures, text or numbers for human use.
>
> "Second, the physical integration of telecommunications and computers has been facilitated by the development of integrated circuits, the famous micro-chips. These permit computer power to be distributed throughout telecommunications networks. Beyond this, micro-chip technology is extremely inexpensive, very small, highly reliable and extraordinarily powerful. The net effect is to make information technology portable and nearly invisible, allowing it to be applied in an extraordinarily wide variety of situations. This is the key to its pervasiveness."

The brief goes on to note that, during the last decade, the effects of this technology-converging trend "have become particularly clear in a new generation of equipment that has come on the market and which is based on the complete integration of computers and communications." This new equipment obviously refers to office equipment, the third element that is converging technologically.

Office equipment is certainly where this trend is, or at least should be, most visible. Were it not for the realization that something must be done to improve the productivity of the office worker (the knowledge worker), convergence would be an elegant conceptualization of a solution looking for a problem.

Thus, converging technology could be described as integration in progress. However, integration does not end with technological convergence; organization, procedures, methods and techniques are required to allow humans to take full advantage of these advances.

3.1 Convergence of the means

Convergence is a function of EDP, office equipment, telecommunications and the interface of each with the human user. The difficulty in recognizing convergence is certainly due, to a large extent, to the fact that the current degree of divergence is itself not clear. An examination of each variable of the convergence equation would be useful in support of this proposition.

3.1.1 *The EDP variable*

The Auditor General pointed out in his 1983 report to Parliament (on "The Management of Computing"):

> "We appear to be on the verge of a new wave of computer applications, among them the automation of office processes fundamental to the apparatus of government. This new technology (information technology) offers real opportunities to improve the efficiency of the government's operations and to serve the public better. The fundamental question is whether the present state of EDP in the government, and the initiatives now being taken, will permit the government to take advantage of the new technology of the 1980s and thereafter."

The Auditor General also indicated that "the day is long past when returning to manual systems could be contemplated, even in an emergency" and expressed concern that so much emphasis may be placed on restraint that, "despite the great decline in the hardware costs," government may be left "far behind the private sector, and even behind some other governments."

Until recently EDP was an activity that occurred behind closed doors. Originally, the user presented a statement of the problem in more or less clear terms. Somehow progress was made and the user was required to present a stack of input data. Miraculously, out came the desired results! The user often wondered how all this took place but did not pursue the question so long as the results were obtained.

The next step in the EDP evolution took place when the central user recognized the need to acquire data from the field offices. The EDP organization stretched the wire from the central mainframe to the field office terminals and EDP/telecommunications convergence had begun. To most users, however, all this remained very transparent and the majority of them were content with this transparency blessing.

3.1.2 *The office equipment variable*

The field user, by supplying input data in increasing quantity and quality, began recognizing opportunities for local applications of the data. The central EDP services faced the dilemma of either providing processing power at the distant input points or experiencing increased difficulty in obtaining the valid inputs. Simultaneous with this evolution, two other significant developments were taking place. The central agency's success at providing EDP services caused such an increase in its workload as to prevent it from even contemplating the distant user's needs. As microprocessors came on the scene, computer literacy improved and dispersion was on the way.

Astute office equipment business people, realizing that computers could not be introduced to the office through the computer organization, wisely called them word processors and sold them as office equipment to office managers. Office equipment/EDP technology convergence - but also organizational divergence - had begun.

In retrospect, the word processor can be recognized as the distant user's attempt at getting some local processing power. How many local inventories, personnel mini-data bases, mini-financial systems, etc. are stored and operated in word processors? The local user had acquired the taste for local processing, and the office equipment suppliers were not about to let the opportunity slip by.

It was a small step to the realization that word processors would be a very handy tool to get text from one office to the other if they could be made to communicate. Communicating word processors began appearing and the office equipment/telecommunications convergence was triggered.

3.1.3 *The telecommunications variable*

To the telecommunications user a parallel evolution took place over a longer period, having started earlier. From two telephones and a pair of wires for each point-to-point telephone conversation in the beginning (telephones were ordered in pairs in those days!) to today's point-to-world communication with only one telephone set at the caller's end, a lot has happened beyond the spot where the wire of the user's set goes into the wall. One of these

behind-the-scene events was the move from electro-mechanical to electronic switching. In this case telecommunications/EDP convergence was on the way, as computers were introduced to do the switching. However, the user was still quite happy to let all this happen and could not care less how it was developing so long as the dial tone kept coming and the called party kept answering. In other words, transparency was bliss.

Transparency was bliss ... but the ability to view data while conversing about it would be much better. The answer to this wish was the displayphone, and with its appearance on the scene telecommunications/office equipment convergence had begun.

EDPers call the phenomenon "informatics." Telecommunicators call it "telematics." Office workers call it "bureautics." Now all this bickering about semantics is making people part of the problem, and each group is intent on protecting its turf. The danger is very real that the whole could turn into a "peoplics" problem.

In summary, to this day, convergence has been technology driven; that is, the means are converging. Unfortunately, to this day also, technology has concentrated only on automating paper flow, luring itself into the belief that it was addressing information flow. Information flow is not complete until it has been absorbed by someone to improve that person's level of knowledge or to prompt that person into action. Thus, the requirement must be stated in terms that will promote technology convergence and stop organizational divergence.

4. The requirement

In spite of the surge in development of smaller, faster and cheaper widgets, few of the elements of computer, telecommunications and office equipment really work together to their full potential. For the most part they are stand-alone systems or closed systems that will only work with certain other equipment. Proprietary protocols and contradictory standards still leave users with systems that fail to satisfy their real requirements. When the interchange is possible, it is usually still so tedious, arduous, cumbersome and annoying that the user does not even want to attempt it. As one writer puts it: "Compatibility is progressing between some communications and data processing vendors. Congeniality has hardly been touched."

Workstations offer access to such facilities as telephone, teleprinter, facsimile, personal computing, graphics, word processing, data bases, data transmission, teletex and perhaps even video from one integrated unit. Yet people still have to cut-and-paste the

paper outputs from each of these sophisticated tools and, at the other end, often have to re-input the data relevant to their function.

Clearly the action is at the terminal (office equipment) end of the converging technologies. This is also where the most confusion exists, as technology has surpassed the current organizational ability to absorb and take advantage of these new capabilities. The requirement, then, must be addressed from the human and management, as well as the organizational, perspective.

5. The ends

5.1 The people

One way of describing the vision of the integrated office from the users' perspective is in terms of demands. These, although stated in more technical terms than the user might employ, are as follows:

> "- First, he needs resources on demand ... the resources (invisible to him) of the PBX, of data processors, perhaps of a local area network, available in a convenient manner, principally through his workstation.
>
> "- Second, he needs bandwidth on demand, although he may not even know what bandwidth is. But he needs to be able to make a telephone call using 64 or less kilobits of bandwidth, or to call up a high-resolution graphic on his screen, using two megabits of bandwidth.
>
> "- Third, he needs processing on demand, for any one of a hundred applications, using processing power either in his terminal or in a central processor. Again, he doesn't much care, as long as it's there when he needs it.
>
> "- Fourth, he needs functionality on demand, the ability to quickly and easily select and use the function he needs, whether it's broadcasting a voice message, or retrieving a file, or manipulating his budget."*

A study on the effects of information technology on employment (Appendix I) notes that the unique needs of workers in an information technology environment differ from the more generic needs within the structure of data processing. As difficult as it will be "to determine what they will find truly useful in a set of

*Computers and People, (Newtonville, MA: Berkeley Enterprises, Inc., January-February 1982).

technologies they have had little or no experience with," when these fundamental people requirements are met, the management decisions required to plan, organize, direct and control this knowledge worker's environment will be very much facilitated.

5.2 The management

The onus is no longer just on industry and regulators to make these management decisions possible. The office workers' managers must now restate the requirement. Innovative approaches must be recognized and introduced to allow people to make optimum use of the technology available to them.

It is up to government managers to prepare the path within their organizations. Faced with large investments in incompatible equipment, confusing market options and proliferous quantities of paper carriers of information, the task of automating is somewhat disheartening.

It should be clear that how to achieve office automation technologically is no longer the question; the technology is abundantly ripe. The questions of today are:

- What is information?
- Where, why, how does it need to flow?
- Who creates and absorbs it?
- And how can computers, telecommunications and office equipment be applied to automate that which can be and is used to improve the productivity of knowledge workers?

Questions such as these do reflect the obvious trend manifested in the information technology industry. They explain why the emphasis is now shifting towards expert systems and decision support systems to help managers. Finally, the realization that information technology must be applied to come to the aid of the knowledge worker as opposed to the "paper-pusher" is indicative that the Auditor General's message is being heard. These questions also point to entirely new dimensions which now need to be considered.

"No responsibility has been so seriously and consistently underestimated in recent years as that of managing the integration of office information systems," stated J.H. Carlisle, of Office of the Future Inc. in a paper entitled "Managing the Integration of Office Information Systems." Although the responsibility for integrated information systems management has been the subject of much pondering, no cut-and-dried solution has been forthcoming.

But the message is clear: technology convergence must be managed if office integration is to happen. Probably the most crucial decisions that face the manager will concern the organization and its impact on the human element of its function.

5.3 The organization

Converging technology can only occur through people and for people. Steps taken to make this happen are reflected in organizational changes based on sound management decisions.

The organizational dimension now facing management is the search for the answer to: How can information/knowledge work be organized using the new tools offered by information technology? And certainly not: How can the old methods of handling paperwork be automated? It should be obvious that the latter approach, if it is pursued, will compound the problem beyond recovery.

Through the ensuing pages, many questions related to convergence are shown to be still unresolved. How will the market be structured? What kind of reorganization is required? Will Local Area Networks (LANs) or Private Branch Exchanges (PBXs) be the dominant link? How can the labour force adjust to the changes? And so forth.

Of all the issues in question, one postulation, at least, goes uncontended - that productivity improvement is the ultimate goal of the automated office. Given that productivity can be described in terms of efficiency and effectiveness, two further suppositions are proffered: efficiency is "doing things right" and effectiveness is "doing the right things."

With this in mind, in the following pages the reader is invited to consider the current status of telecommunications in the government (the historical facts), then examine the issues presented in the planning framework (supported by three studies). Hopefully, government planners will thereby be assisted in identifying the requirements to meet that goal.

D. Review of Fiscal Year 1982/1983

As pointed out in the previous section, convergence is a relative concept and is most difficult to measure. The annual review of the telecommunications expenditures in the Government of Canada provides a basis on which to extrapolate for the future as well as a reference against which to measure convergence.

This section of the Annual Review deals with telecommunications expenditures and personnel involved in providing telecommunications services within the federal Government of Canada. Each year, Treasury Board requires all departments named in schedules A or B of the Financial Administration Act whose telecommunications expenditures exceed $20,000 to submit telecommunications sections of the Information Technology and Systems Plans (ITSP). The review consists of a summary of the ITSP mechanisms, an analysis of the financial data and of the Government Telecommunications Agency (GTA) charges and a forecast into the future.

1. Information Technology and Systems Plan

The procedure, response and coverage of the ITSP is the subject of this sub-section.

1.1 Procedure

In August, 1983, Treasury Board requested departments to prepare their ITSPs for submission in February, 1984. For the 1984 ITSP, 62 departments were requested to report their telecommunications expenditures, activities and plans for fiscal years 1982/83 through 1987/88. Sixty-three departments were surveyed by the previous year's ITSP. Canada Post, because of its newly acquired crown corporation status, was not requested to participate in the 1984 ITSP.

The format and content of the 1984 ITSP were similar to those of the previous year. Following Treasury Board's formal request for the 1984 submission, GTA provided all departments involved with summaries of their 1982/83 charges for GTA services. In January, 1984 ITSP workshop sessions were arranged for all interested departments and assistance was provided in completing their submissions.

1.2 Coverage

Information collected from the telecommunications section of the ITSP is used to estimate telecommunications expenditures for the total federal government. Of the 62 departments requested to report, 58 had responded by the end of August, 1984.

Results from the 58 departments responding to ITSP, combined with estimates of the expenditures of the four departments not reporting, were used as the sample from which total federal government telecommunications expenditures were calculated. Forecast data available from 1982 ITSPs were used as estimates for non-reporting departments.

2. Financial analysis

The total telecommunications expenditures are analyzed first. This analysis is followed by a discussion of each of the major components of the total; that is, the operating, capital and personnel expenditures. The distribution of expenditures among shared, customized and departmental services concludes the analysis. Tables 1 to 8 and Graphs 1 and 2 referred to in the text have been grouped at the end of this section.

2.1 Total telecommunications expenditures (Tables 1 and 2)

Total telecommunications expenditures, including telecommunications personnel-related expenditures, as derived in Table 2 from the summation of total departmental telecommunications expenditures, amounted to $496,259,000 in 1982/83, an increase of 16.3 per cent over 1981/82. A breakdown of total telecommunications expenditures shows that operating expenditures increased by 12.6 per cent, capital expenditures increased by 50.2 per cent and personnel-related expenditures increased by 12.5 per cent. The comparison of each telecommunications category to total telecommunications expenditures reveals its relative magnitude. Results of this comparison are as follows: 59 per cent operating expenditures, 12.7 per cent capital expenditures and 28.3 per cent personnel-related expenditures. Historically, total telecommunications expenditures have increased at a 15-20 per cent annual rate with 1981/82 expenditures measuring 14.6 per cent. This pattern is displayed in Graph 1, which presents past year's total telecommunications expenditures, including and excluding personnel-related expenditures.

Analysis of departments grouped by size of reported 1982/83 total telecommunications expenditures shows that departments with total expenditures in excess of one million dollars had average expenditure increases of approximately 16 per cent. In comparison, those departments with expenditures of less than one million dollars showed increases of over 37 per cent. Compared to the total federal government increase of 16.3 per cent, and considering that these departments account for less than 6 per cent of total federal government telecommunications expenditures, it is obvious that smaller departments have relatively less effect on overall trends and growth rates. Similar growth patterns were displayed in 1981/82, when the expenditures of the largest telecommunication users increased by 12 per cent while the smaller ones reported a growth rate of 20.5 per cent and the overall increase was 14.6 per cent.

2.2 Telecommunications operating expenditures (Table 1)

Total telecommunications operating expenditures increased by 12.6 per cent in 1982/83 to $292,912,000. This compares to a 21.1 per cent increase in 1981/82. Historically, operating expenditures have shown growth rates of between 11 and 16 per cent with the exception of 1981/82. Detailed analysis of operating expenditures shows that outlays on telecommunications services increased by 13.6 per cent, repair expenditures increased by 10.7 per cent and leasing declined by 4.6 per cent. Breaking out telecommunications expenditures in another way, operating voice, data/message and image transmission expenditures have increased by 11 per cent, 16 per cent and 36 per cent respectively.

The increase in operating expenditures is considered to be a result of moderate price increases from suppliers and expansion of services required in support of federal government programs.

2.3 Telecommunications capital expenditures (Table 1)

Telecommunications capital expenditures increased substantially in 1982/83 to $63,244,000, a 50.2 per cent increase over 1981/82. This compares to a decline of 4.5 per cent in 1981/82. A pattern of large increases in one year with declines in alternate years appears to be a continuing trend. This is evidenced by the rates of change of capital expenditures measured for the years 1978/79 through 1981/82 which were 19.9 per cent, -13.9 per cent, 46.9 per cent and -4.5 per cent respectively. In 1982/83, only 20 of the 58 departments reporting had capital expenditures and of these only one had total telecommunications expenditures of less than one million dollars. In addition, the majority of departments reporting capital expenditures in 1982/83 also made purchases in 1981/82.

A breakdown of capital expenditures shows that 40 per cent of the total was for construction, acquisitions and parts related to voice telecommunications, 50.3 per cent for data/message telecommunications and 9.7 per cent for image telecommunications. Capital expenditures relating to voice and data/message telecommunications grew by 56 per cent and 50 per cent respectively, while capital expenditures for image telecommunications increased by 31 per cent.

The following departments accounted for most of the $63 million capital expenditure:

- National Defence
- Royal Canadian Mounted Police (RCMP)
- External Affairs
- Environment Canada
- Communications
- Fisheries and Oceans

2.4 Telecommunications personnel and related expenditures (Tables 1 and 3)

Total telecommunications personnel-related expenditures reported for 1982/83 amounted to $140,103,000. This reflects a 12.5 per cent increase over 1981/82. Salaries, the major component of personnel-related expenditures (98 per cent), were responsible for this increase, measuring a growth of 12.6 per cent. Other personnel-related expenditures, which include training, service contracts and telecommunications consulting expenditures, increased by 4.7 per cent.

Adjustment was required to personnel-related expenditures reported by the RCMP in their 1982 ITSP, resulting from their refinement in defining positions and duties primarily dedicated to telecommunications functions in the 1984 ITSP. The resulting adjustment amounted to a reduction of $22,887,000 from 1981/82 telecommunications personnel-related expenditures.

Total telecommunications person-years reported (including estimates for non-reporters) amounted to 6,190 for 1982/83. Because of changes in methods and definitions used by some departments in determining telecommunications person-years this value cannot be compared to last year's estimated total telecommunications person-year utilization of 7,311. Total 1981/82 telecommunications person-years were consequently adjusted to 6,276. On this basis, person-years are estimated to have decreased by approximately 1.4 per cent from 1981/82 to 1982/83.

The identification of person-years related to the provision of telecommunications services continues to be a problem for departments. Changes in departmental methodology used to derive this information tend to make the data unreliable and inconsistent.

2.5 Shared, customized and departmental services (Table 4)

Table 4 reveals the distribution of telecommunications expenditures among shared, customized and departmental services.

The decrease in the proportion of shared services used is considered to be a result of the significant increase in 1982/83 capital expenditures which are departmental in nature. The increase in the customized service total is attributed to changes in procurement procedures and consolidated billing for Telecom Canada Telpak services paid through the GTA revolving fund. Department of National Defence (DND) and Transport Canada (TC)/Atmospheric Environment Service (AES) of Environment Canada circuits included under these arrangements are still planned, managed and implemented by the departments.

The contents of Table 4 were developed using information contained in the departmental ITSPs and GTA customer account records. While voice and data/image services are generally distinguishable, the use of the shared voice network for data and image transmission results in a certain percentage of inaccuracy. In addition, costs relating to data/image transmission are occasionally reported in the EDP section of the ITSP and are therefore excluded from these results.

3. Government Telecommunications Agency charges

The Department of Communications Act (RSC-1970, c.24, s.5) states, in part, that the Minister of Communications shall "plan and coordinate telecommunications services for departments, branches and agencies of the Government of Canada." This responsibility (in accordance with T.B. 714755) is assigned to GTA. The Agency operates on a cost-recovery basis through a revolving fund. This sub-section gives details on the makeup and apportionment of GTA charges.

3.1 Government Telecommunications Agency revolving fund (Table 5)

Total recoveries from departments for shared and customized telecommunications services increased by 63.8 per cent in 1982/83 over 1981/82. The major change was in voice inter-city customized services, which increased by 438.8 per cent, from $7,345,000 in 1981/82 to $39,575,000 in 1982/83.

As is shown in Table 5, voice inter-city shared services increased by 19.8 per cent while local voice service charges increased by 11.2 per cent. GTA-shared inter-city message services increased by only 4.4 per cent, in contrast to inter-city customized data services, which increased by 47.4 per cent.

3.2 Government Telecommunications Agency operating expenditures

Operating expenditures represent charges to GTA for services it manages and provides to departments on a cost-recovery basis. In 1982/83 operating expenditures amounted to $108,238,537, an increase of 68 per cent over 1981/82. The acquisition of customized services for departments, which increased by 278.8 per cent, was the major factor contributing to the increase in operating expenditures.

3.3 Government Telecommunications Agency administration expenditures

GTA administration expenditures measured $8,420,498 in 1982/83, which represented a rise of 26.6 per cent from 1981/82, but only 7.2 per cent of total GTA revenue. (Historically, administration

expenditures have accounted for 9-10 per cent of total revenues.) The increase was largely due to a very significant rise in Public Works Canada rental charges, additional person-years, the person-year mix and salary increases.

3.4 Comparison of costs of government inter-city (IX) network and public long distance network

The following is a comparison of the costs of placing some typical long distance calls from government telephones using direct access to the government IX network and Direct Distance Dialing (DDD) on the public long distance network.

COST OF TYPICAL 3 MINUTE LONG DISTANCE CALLS
DURING BUSY HOUR

Origin	Destination	*IX network (direct access)	Public long distance network (DDD)	Percentage cost savings using IX network
Ottawa	Kingston	$ .78	$1.64	52.4
Ottawa	Montreal	$ .84	$1.79	53.1
Ottawa	Toronto	$ .96	$1.94	50.5
Ottawa	Windsor	$1.38	$2.04	32.3
Ottawa	Calgary	$1.68	$3.30	49.1
Ottawa	Halifax	$1.35	$2.70	50.0
Ottawa	Vancouver	$1.98	$3.30	40.0
Ottawa	Winnipeg	$1.50	$3.00	50.0

Sizable savings can be derived through the use of the government inter-city network. It is estimated that on average this network results in savings of the order of 50 per cent when compared to commercial long distance service available directly from the common carriers (direct distance dialing).

3.5 GTA services utilization (Table 6)

In 1982/83 GTA provided $116,854,000 of telecommunications services to departments and agencies within the federal government. These services represent 42.8 per cent of all telecommunications services utilized. In 1981/82 GTA provided 30.7 per cent of the total telecommunications services.

*Government inter-city network charges used to derive the above information include the portion of GTA administration charges applicable to these services. If operator assistance is required an additional charge of 60 cents per call is levied.

Details of GTA service utilization for 1982/83 are delineated in Table 6. This table shows that GTA services constituted 77.8 per cent of total voice inter-city services, 5.9 per cent of total voice local services and 21.3 per cent of total data/message/image inter-city services. Data/message/image local services from GTA are insignificant.

Comparing 1982/83 results with 1981/82 shows that voice inter-city and local services have both increased, while data/message/image inter-city services showed a decline.

The validity of the information relating to data/message/image is questionable. This results from the reporting of data services expenditures in both the telecom and EDP sections of ITSP and from the use of shared voice facilities for data and image transmission.

4. Future

A forecast of expenditures and personnel is provided here and some changes to the 1985 ITSP are mentioned.

4.1 Forecast of expenditures and personnel (Tables 7 and 8)

Forecasts of operational and capital telecommunications expenditures are based on historical data received from past ITSPs using exponential regression techniques. Telecommunications personnel-related expenditures were developed from forecasts of telecommunications person-year requirements reported by departments in the 1984 ITSP and the arbitrary assumption that salary increases in the foreseeable future will amount to 5 per cent. Tables 7 and 8 contain the results of these analyses.

Telecommunications operating expenditures are forecast to grow at 12-13 per cent per year during 1983/84 through 1987/88. Capital expenditures are forecast to increase by only 4 per cent in 1983/84 and then to grow at an average annual rate of 16 per cent. Personnel-related expenditures are estimated to increase at rates ranging between 7 per cent and 8 per cent during the years 1983/84 through 1987/88. The combination of these estimated expenditures indicates that total telecommunications expenditures, including personnel-related expenditures, will increase at between 10 per cent and 12 per cent per year during 1983/84 through 1987/88.

Because of the limited nature of their derivation and the unknown influences that may affect policy, these forecasts are offered as indicators only and not as inflexible planning aids.

4.2 Future developments

Significant changes in the amount of detailed information required for the 1985 ITSP have been made. ITSP will now request information which in most instances will have already been generated by departments for their own management needs. Therefore, a possible reduction in the workload placed on departments with respect to ITSP is anticipated.

One additional organization, the Medical Research Council Of Canada, will be required to submit its telecommunications section of the ITSP for the first time in 1985. ITSPs will not be received from the Ministry of State for Economic and Regional Development and the Ministry of State for Social Development as a result of their dissolution.

In April, 1984 new economic objects were released for telecommunications. This will necessitate some adjustments to departmental financial systems to ensure availability of expenditure data in appropriate groupings to support management and ITSP.

The TAC working group on planning is actively involved in the development of a long-range plan for telecommunications in the federal government. This could significantly benefit departments by providing support and guidance for departmental telecommunications planning.

TABLE 1

TELECOMMUNICATIONS EXPENDITURES BY CATEGORY

OPERATING EXPENDITURES	1980/81 ($000)	% CHANGE	1981/82 ($000)	% CHANGE	1982/83 ($000)
Telephone Services-Common Carrier, GTA	110,886		164,490		189,771
Message, Data Communications Services-Common Carrier, GTA, Computer Communications Services	64,658	30.3	67,932	13.6	78,732
Other Communication Services	10,349		9,857		6,638
Repair-Lines Telecom Equipment Broadcasting, Radio & TV Relay & Booster Stations, Telephone Exchanges Telecom Equipment for Computers	8,731	-51.9	4,197	10.7	4,644
Rentals-Telecom Equipment not included in normal telephone service	20,169	-31.8	13,764	- 4.6	13,127
TOTAL OPERATING	214,793	21.1	260,240	12.6	292,912
CAPITAL EXPENDITURES					
Telecom Equipment-Related Parts & Consumables excl Computers (ADJUSTED)	5,023	5.9	5,319	22.0	6,489
Telephone & Telegraph Lines, Broadcasting Radio & TV Relay & Booster Stations, Telephone Exchanges Telecom Equipment excl Computers (ADJUSTED)	39,042	- 5.8	36,781	54.3	56,755
TOTAL CAPITAL	**44,065	-4.5	42,100	50.2	63,244
PERSONNEL RELATED EXPENDITURES					
Professional & Special Services	939	135.6	2,212	4.7	2,316
Salaries (Unadjusted)	132,569	9.5	145,224		140,103
Salaries (Adjusted)			* 122,337	12.6	137,787
TOTAL PERSONNEL (UNADJUSTED)	133,508	10.4	147,436		
TOTAL PERSONNEL (ADJUSTED)			* 124,549	12.5	140,103
TOTAL TELECOMMUNICATION EXPENDITURES (ADJUSTED)	392,366	14.6	449,776 426,889	16.3	496,259

* Personnel-related expenditures have been adjusted to reflect refinements made by the RCMP in defining telecommunications functions in the 1984 ITSP. This adjustment amounted to $22,887,000 and is reflected in both personnel-related expenditures and total telecommunications expenditures.

** Capital expenditures reported in 1980/81 have been adjusted to reflect refinements made by National Defence in the separation of telecommunications embedded in weapon systems versus strategic operational and administrative telecommunications capital expenditures.

TABLE 2

TOTAL TELECOM EXPENDITURES (INCLUDING SALARIES)

DEPARTMENT / AGENCY	1982 / 1983 TOTAL TELECOM (INCL SALARIES) ($ 000)	% OF TOTAL	1981 / 1982 TOTAL TELECOM (INCL SALARIES) ($ 000)	% CHANGE 1982 / 1983 COMPARED TO 1981 / 1982
NATIONAL DEFENCE	161,125	32 5	135,682	18
* RCMP	66,838	13 5	83,687	- 20
EMPLOYMENT AND IMMIGRATION	38,762	7 8	29,686	30
TRANSPORT CANADA	32,595	6 6	29,558	10
EXTERNAL AFFAIRS	27,674	5 6	23,269	18
ENVIRONMENT CANADA	22,954	4 6	NR	0
REVENUE CANADA TAXATION	12,841	2 6	11,673	10
SUPPLY AND SERVICES SERVICES	8,982	1 8	7,029	27
HEALTH AND WELFARE	8,903	1 8	7,583	17
FISHERIES AND OCEANS	8,695	1 8	6,926	25
INDIAN AND NORTHERN AFFAIRS	6,994	1 4	5,884	18
COMMUNICATIONS	6,945	1 4	6,148	12
** AGRICULTURE CANADA	6,861	1 4	5,849	17
ENERGY MINES AND RESOURCES	6,299	1 3	4,972	26
REGIONAL INDUSTRIAL EXPANSION	6,188	1 2	5,020	23
REVENUE CANADA CUSTOMS & EXCISE	6,060	1 2	4,913	23
PUBLIC WORKS	5,644	1 1	NR	0
SUPPLY AND SERVICES SUPPLY	5,079	1 0	4,800	5
CORRECTIONAL SERVICES	4,099	0 8	4,726	- 13
STATISTICS CANADA	3,955	0 8	3,755	5
VETERANS AFFAIRS	3,410	0 7	2,779	22
PUBLIC SERVICE COMMISSION	3,193	0 6	2,891	10
SECRETARY OF STATE	2,917	0 6	2,867	1
CONSUMER AND CORPORATE AFFAIRS	2,283	0 5	1,756	30
NATIONAL RESEARCH COUNCIL	2,064	0 4	1,802	14
NATIONAL MUSEUMS	1,855	0 4	1,704	8
JUSTICE	1,654	0 3	1,567	5
NATIONAL LIBRARY	1,560	0 3	663	135
** ECONOMIC DEVELOPMENT	1,468	0 3	240	511
NATIONAL FILM BOARD	1,461	0 3	1,225	19
CANADIAN INTERNATIONAL DEVELOPMENT AGENCY	1,309	0 3	1,053	24
FINANCE	1,058	0 2	843	25
PRIVY COUNCIL	966	0 2	832	16
LABOUR	885	0 2	801	10
CANADIAN TRANSPORT COMMISSION	877	0 2	810	8
TREASURY BOARD	828	0 2	802	3
NATIONAL PAROLE BOARD	695	0 1	378	83
PUBLIC ARCHIVES	674	0 1	725	- 7
AUDITOR GENERAL	605	0 1	498	21
NATIONAL ENERGY BOIARD	512	0 1	427	19
SOLICITOR GENERAL	468	0 1	408	14
CANADIAN RADIO-TELEVISION & TELECOMMUNICATIONS COMMISSION	454	0 1	437	3
ATOMIC ENERGY	293	0 1	176	66
MINISTRY OF STATE FOR SOCIAL DEVELOPMENT	227	0	125	81
COMMISSIONER OFFICIAL LANGUAGES	212	0	176	20
** SCIENCE AND TECHNOLOGY	191	0	153	24
NORTHERN PIPELINE AGENCY	168	0	207	- 18
PUBLIC SERVICE STAFF RELATIONS BOARD	163	0	140	16
CANADA LABOUR RELATIONS BOARD	144	0	NR	0
CANADIAN HUMAN RIGHTS COMMISSION	143	0	104	37
INSURANCE	142	0	98	44
ECONOMIC COUNCIL OF CANADA	130	0	128	1
CHIEF ELECTORAL OFFICER	116	0	67	73
** SCIENCE COUNCIL OF CANADA	108	0	101	6
SOCIAL SCIENCES & HUMANITIES RESEARCH COUNCIL	107	0	119	- 10
IMMIGRATION APPEAL BOARD	105	0	91	15
STATUS OF WOMEN	85	0	53	60
CANADIAN INTERGOVERNMENTAL CONFERENCE BOARD	84	0	84	0
SUPREME COURT OF CANADA	76	0	72	5
TARIFF BOARD	52	0	41	26
COMMISSIONER FOR FEDERAL JUDICIAL AFFAIRS	39	0	NR	0
ADJUSTMENT FOR TOTAL GOVERNMENT REPRESENTATION	14,985	3 0	41,173	
ADJUSTMENT FOR CHANGES IN REPORTING METHODOLOGY			(22,887)	
TOTAL EXPENDITURES	496,259	100	426,889	16 3

* 1982 / 83 Expenditures reported by the RCMP cannot be compared with their 1981 / 82 expenditures This results from their refinement in identifying telecommunications functions and associated expenditures in the 1984 ITSP

** 1982 / 83 Expenditures have been estimated using forecasts provided in the 1982 ITSP

NOTE NR in the 1981 / 82 Total Telecom column indicates that no report was provided

TABLE 3
TELECOMMUNICATIONS PERSONNEL
1982 /83

OCCUPATIONAL GROUP	MANAGERIAL	COORDINATION	EQUIPMENT OPERATION	ENGINEERING MAINTENANCE	ENGINEERING SUPPORT	1982 / 83 TOTAL
UNIFORMED PERSONNEL	133.4	339.0	1887.2	809.0	105.2	3273.8
CR- CLERICAL & REGULATORY	1.0	282.6	889.0		7.4	1180.0
CM- COMMUNICATIONS	1.0	4.9	618.9	2.1		626.9
AS- ADMIN SERVICES	105.2	167.2	5.6		1.0	279.0
SCY,ST,TYP- SECRETARIAL		61.6	183.6	0.6	2.0	247.8
EL- ELECTRONICS	8.0			120.2	4.0	132.2
ENG- ENGINEERING	1.0			1.0	27.0	29
GES-MAN- MESSENGER SERVICE		24.0				24.0
CS- COMPUTER SYSTEMS ADMIN	8.3	6.6		1.5	5.4	21.8
OCE- MACHINE OPERATOR		3.0	17.3	0.4		20.7
GS- GENERAL SERVICES				12.0		12.0
PG- PURCHASING & SUPPLY	2.8	9.0	0.1			11.9
DA- DATA CONVERSION	1.2	2.0	8.7			11.9
FI- FINANCIAL ADMIN	2.2	5.1		2.0		9.3
IS- INFORMATION SERVICES	8.0	1.0				9.0
OM- ORGANIZATION & METHODS	2.0	3.0			2.0	7.0
DD- DRAFTING					7.0	7.0
SI- SOCIAL SCIENCE SUPPORT		3.0				3.0
RO- RADIO OPERATIONS			3.0			3.0
SM- SENIOR MANAGEMENT	2.0					2.0
ES- ECONOMIST, STATISTICAL, SOCIOLOGIST					2.0	2.0
EG- ENGINEERING & SCIENTIFIC				2.0		2.0
EX- EXECUTIVE	1.2					1.2
SA- SENIOR EXECUTIVE	1.0					1.0
OTHER	15.6	45.8	204.6	5.0	1.0	272
TOTAL	293.9	957.8	3818.0	955.8	164.0	6189.5

TABLE 4

SHARED, CUSTOMIZED AND DEPARTMENTAL SERVICES
% OF TOTAL

SERVICES	YEAR	SHARED	CUSTOMIZED	DEPARTMENTAL
VOICE	1982 / 83	48.4	17.9	33.7
	1981 / 82	50.4	3.9	45.7
DATA & IMAGE	1982 / 83	4.1	6.7	89.2
	1981 / 82	8.2	5.6	86.2
TOTAL	1982 / 83	32.7	13.9	53.4
	1981 / 82	36.1	4.5	59.4

TABLE 5
GTA REVENUES
1981/82 - 1982/83

YEAR	SERVICES	REVENUES ($000)	% OF TOTAL	INCREASE FROM PREVIOUS YEAR
1982/1983	VOICE			
	INTERCITY SHARED	60,390	51.6	19.8
	INTERCITY CUSTOMIZED	39,575	33.7	438.8
	TOTAL INTERCITY	99,965	85.5	73.1
	LOCAL	3,753	3.2	11.2
	TOTAL VOICE	103,718	88.7	69.7
	DATA, MESSAGE, OTHER			
	INTERCITY SHARED	4,643	4.0	4.4
	INTERCITY CUSTOMIZED	8,493	7.3	47.4
	TOTAL INTERCITY	13,136	11.3	28.6
	LOCAL	0	0	0
	TOTAL DATA, MESSAGE, OTHER	13,136	11.3	28.6
	TOTAL GTA	116,854	100	63.9
1981/1982	VOICE			
	INTERCITY SHARED	50,396	70.7	25.0
	INTERCITY CUSTOMIZED	7,345	10.3	47.4
	TOTAL INTERCITY	57,741	81.1	27.5
	LOCAL	3,376	4.7	23.1
	TOTAL VOICE	61,117	85.8	27.2
	DATA, MESSAGE, OTHER			
	INTERCITY SHARED	4,449	6.2	7.6
	INTERCITY CUSTOMIZED	5,762	8.1	40.2
	TOTAL INTERCITY	10,211	14.3	23.9
	LOCAL	0	0	0
	TOTAL DATA, MESSAGE, OTHER	10,211	14.3	23.9
	TOTAL GTA	71,328	100	26.7

TABLE 6

BREAKDOWN OF OPERATING TELECOMMUNICATIONS EXPENDITURES FOR 1981/82 AND 1982/83

YEAR	SERVICES		A 02 OPERATING TELECOM EXP. ($'000) (% OF TOTAL)		B 02 OPERATING TELECOM EXP. RECOVERED BY GTA ($'000) (% OF TOTAL)		(%) OF A RECOVERED BY GTA B / A
1982/83	VOICE	INTERCITY	128,468	(47.1)	99,965	(85.5)	77.8
		LOCAL	63,396	(23.2)	3,753	(3.2)	5.9
	DATA MESSAGE IMAGE	INTERCITY	61,572	(22.6)	13,136	(11.3)	21.3
		LOCAL	19,504	(7.1)	0	(0)	0
	TOTALS		272,940	(100)	116,854	(100)	42.8
1981/82	VOICE	INTERCITY	88,043	(37.9)	57,741	(81.0)	65.6
		LOCAL	81,595	(35.1)	3,376	(4.7)	4.1
	DATA MESSAGE IMAGE	INTERCITY	35,411	(15.2)	10,211	(14.3)	28.8
		LOCAL	27,374	(11.8)	0	(0)	0
	TOTALS		232,423	(100)	71,328	(100)	30.7

TABLE 7

TELECOMMUNICATIONS EXPENDITURES AND PERSON-YEAR FORECAST

YEAR	TOTAL TELECOM EXPENDITURES (excluding Personnel Related Expenditures) ($000)	TELECOM PERSON-YEARS REPORTED	FORE-CAST GROWTH %	TOTAL TELECOM PERSONNEL RELATED EXPENDITURES ($000)	TOTAL TELECOM EXPENDITURES (Including Personnel Related Expenditures) ($000)
1982/83	356,156	6,190		140,103	496,259
1983/84	394,056	6,326	* 2.2	150,345	544,401
1984/85	445,736	6,421	* 1.5	160,230	** 605,966
1985/86	504,248	6,626	* 3.2	173,625	** 677,873
1986/87	570,505	6,725	* 1.5	185,041	** 755,546
1987/88	645,539	6,839	* 1.7	197,596	** 843,135

* Forecast Growth of Telecom Person-Years provided by reporting departments

** Personnel Related Expenditures were forecast using Person-Years Growth Forecast and 5% for future years.

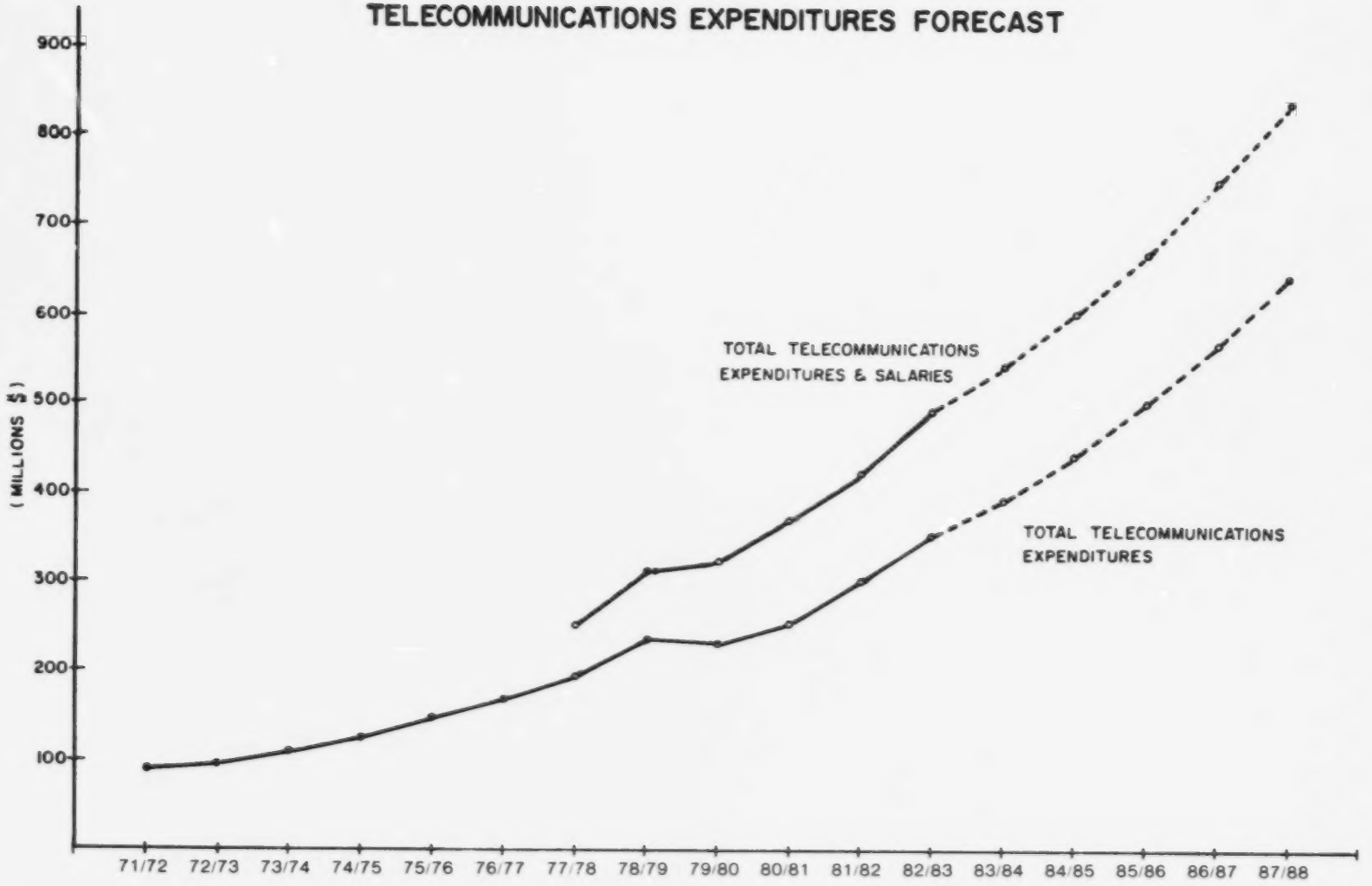
TABLE 8

SUMMARY OF FORECASTS FOR TOTAL TELECOMMUNICATIONS EXPENDITURES

YEAR 1982 TO 1988	TELECOM OPERATING EXPENDITURES ($000)	TELECOM OPERATING & CAPITAL EXPENDITURES ($ 000)	TELECOM OPERATING CAPITAL & PERSONNEL RELATED EXPENDITURES ($ 000)
1982/83	292,912	356,156	496,259
1983/84	328,370	394,056	544,401
1984/85	369,706	445,736	605,966
1985/86	416,246	504,248	677,873
1986/87	468,645	570,505	755,546
1987/88	527,640	645,539	843,135

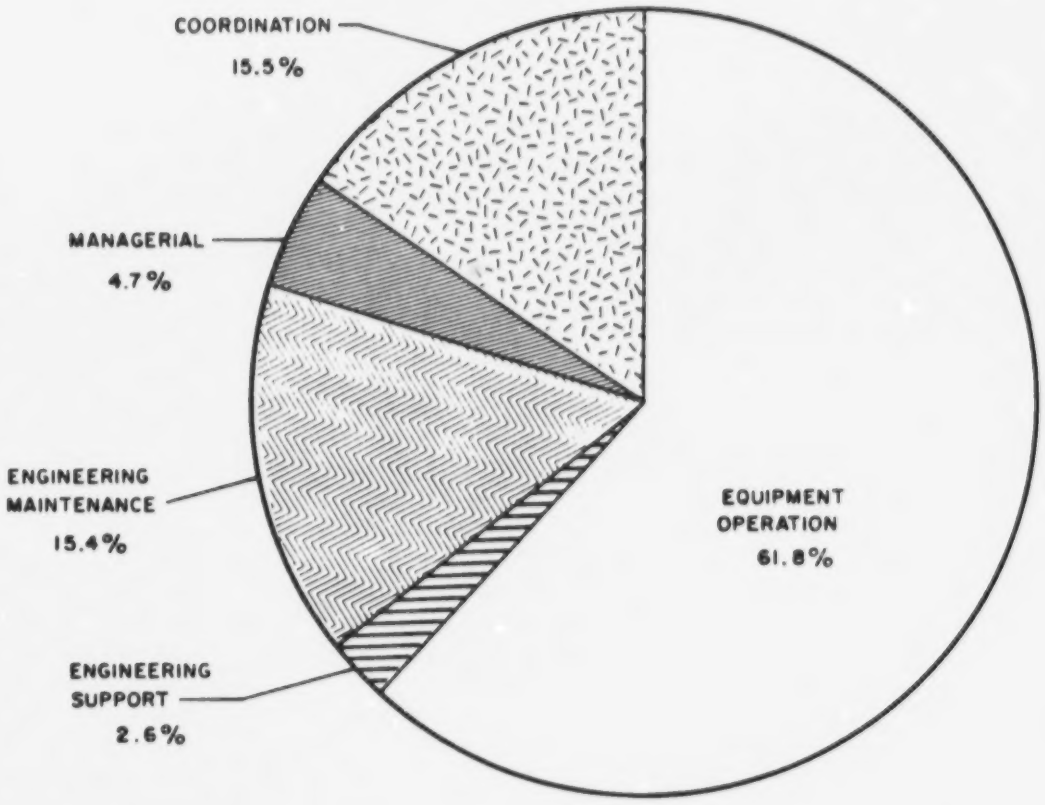
GRAPH 1

TELECOMMUNICATIONS EXPENDITURES FORECAST



GRAPH 2

PERCENTAGE PUBLIC SERVICE TELECOMMUNICATION PERSONNEL EMPLOYED IN VARIOUS AREAS ACTIVITY 1982/83



E. Long-range planning framework

1. Introduction

Sections C and D have introduced the focal theme of this Review (convergence) and presented a synthesis of the current status of telecommunications in the government. With this foundation a planning framework has been constructed to assist telecommunications managers in assessing the associated factors that impact on their planning tasks. The framework is intended to offer a planning strategy based on the conglomerate picture - a strategy that, with improved reporting mechanisms, can be molded to the expressed needs of the users.

2. Government objectives and priorities

In his paper, "A New Direction for Canada - An Agenda for Economic Renewal," released in November, 1984, the Minister of Finance noted that:

> "...as much as two-thirds of recent economic growth has been attributed to technological change and there is every reason to believe that its influence will grow... Both the public and the private sector have important roles to play in increasing Canada's technological strength... Government must play its part, by creating the climate and fostering the entrepreneurial spirit needed to realize increased innovation and to ensure its widespread application."

DOC, in its Communications and Cultural Program, identifies the following specific objective:

> "To develop policies, programs and co-operative arrangements which achieve Canada's social and economic objectives for communications and culture and to foster the orderly development and operation of communications and culture for Canada in both the domestic and international spheres."

Three sub-objectives, related directly to the department's objective and relevant to this year's focus are:

- to foster the application of advanced information and communications technologies and to support the growth and development of industries that create, manufacture and employ those technologies;

- to plan, develop, co-ordinate and provide telecommunications services and facilities that satisfy the requirements of federal departments and agencies at the lowest possible cost;

- to develop policies and programs that promote the development, establishment and efficiency of telecommunications and broadcasting services; to co-ordinate all departmental policy endeavours; and to protect and sustain Canadian interests in international telecommunications and cultural undertakings.

In relating these sub-objectives and others to those of the government at large, DOC addressed the economic situation by placing at its disposal the sophisticated tools required to adapt efficiently and easily to the new converging technological environment. A new sector for Technology and Industry was therefore created to deal with the application of technology and provide support to industry. At the same time the Research Sector was altered to house all of the department's research and development work at the Communications Research Centre (CRC), including the areas of telecommunications, space technology and informatics, bureautics and telematics. Study of technology's effects on human behaviour will also be centralized at the CRC.

In 1984, the objectives of the department were redefined to provide increased support to the major technical sectors: information technology, space and communications techniques. The relationship of these government objectives and priorities to the long-range planning framework will be identified in the sections following.

3. Carriers and industry

Technological evolution may be said to be a process of innovation feeding on discovery. The patterns inevitably formed by this process, though significant, are in the early stages cunningly elusive. Now, in the mid-'80s, with the foundations laid, it is interesting to observe the emerging shape of the industrial world that these technologies comprise.

(The following predictive information is based to a large extent on a United States Office of Management and Budget publication* released in 1983.)

To begin with, as the convergence of technologies progresses, the information processing industries are becoming more and more communications-oriented: Computer users are shifting from batch processing to transaction processing, installing terminal networks; word processing users are shifting to electronic mail often via hierarchical computer networks; information dissemination is

*Five-Year Plan: Meeting the Automatic Data Processing and Telecommunications Needs of the Federal Government

not only being served by mail and broadcast media but also by selective, on-line networks wherever justified by the market; teleconferencing and communicating copiers are in active use. In fact, 1981 figures from the Bureau of Economics, United States Department of Commerce, show that the communications segment of the industry received $69 billion in revenue from the United States information processing market. Taking the other three segments into account, communications accounted for a 46 per cent share, data processing 28 per cent, information dissemination 20 per cent and office equipment 6 per cent. These figures were based on the following breakdown of components and revenues:

SECTOR	COMPONENTS	REVENUE (billions of $)
Data Processing	mainframes minicomputers peripheral equipment and terminals personal computers software and services media and supplies	41
Office Equipment	typewriters and word processors copiers micro-image systems facsimile equipment	10
Communications	telephone service telex and data services customer premise equipment	69
Information Dissemination	newspaper and magazine publishing TV and radio broadcasting	30

Steady improvements in communications services, the emergence of new products and the convergence of technologies are fostering the expansion of markets for many kinds of information processing modules and creating a major structural impact on the information

processing industry itself. Microprocessors, for example, are used by data terminals, word processors and personal computers alike. With the appropriate software, all three can now perform a wide variety of functions and are therefore less distinctive individually than were their prototypes. The consequences are manufacturers must offer all three if they offer one, and providers of specialty products must become knowledgeable about the other components as well as their core product.

In addition, competition is generating an increasing line of hardware and software products which, in turn, require software interfaces to permit inter-operability with existing and past products. The three industries that produce these products are being forced to specialize or face the difficult task of sustaining the development and manufacture of all the subsystem, hardware and software products required.

This intense competition has made marketing increasingly complex. Major suppliers provide their own retail outlets, but the separation of the industries leads also to remote customer support centres, the structure of which is determined by the segment of the market addressed. Business, professional and private customers have varying requirements. Home and small business consumers are largely served by department and office supply stores handling competing products. Corporate system vendors, on the other hand, tend to be a concentrated nucleus of manufacturers whose customers are already committed to their software. In addition to large computers, they are providing end-user workstations in competition with the more numerous specialized vendors.

Predictions are that these corporate system providers will continue to sell proprietary high-level software that requires the user to buy both their mainframes and their workstations. The spread of interface standards, however, can be seen as a constraint to their success and they are vigorously moving into other areas to avoid disaster. Potential major winners are seen to be the companies selling workstations to the overlapping corporate, professional and consumer markets of the future.

Network service providers will also be major winners, offering hardware, software and communications services to both corporate and individual customers. Whether they will both own the information utilities and produce the information they distribute is still a matter to be resolved by the regulators, although continuing product diversification is bringing about a natural affiliation between the two. New network services will probably continue to be provided by the large, established carriers owing to the size of capital investment required to implement them. These carriers will share a significantly larger market.

Finally, as the hardware subsystem market becomes independent of national boundaries, software and data services will offer enticing rewards. These services, for which there is an increasing demand, must reflect national languages, cultures and business patterns, therefore rendering themselves unattractive to foreign suppliers. Domestic providers of these services may well become the superstars of tomorrow.

How can DOC, in the furtherance of its sub-objective "to support the growth and development of industries that create, manufacture and employ those technologies," direct its efforts in concert with these trends? One way is to build on strength, further strengthening and encouraging the industries that represent the best opportunities to improve Canada's trade balance.

High technology commodities are goods that require advanced technology to produce. Statistics Canada figures covering the period 1978-82 indicate that the greater the amount of technology required, the greater our relative dependence on goods produced abroad. In fact, within the manufactured products commodity group, trade in high tech commodities is the largest component of the deficit.

Of the four information technology segments, communications has for several years been dominant. In the data processing segment, good potential gains appear attainable in the software and service areas. Canada's strengths, in other words, are happily in line with the most promising avenues for market revenue advances. That every effort should be directed in their support is strongly indicated.

4. Environmental factors

4.1 Legislation, regulations and standards

4.1.1 *Legislation*

In 1983 Bell Canada was reorganized in response to the demand for corporate changes imposed by the new technologies. The purpose of the new structure was to create a clear distinction between regulated monopolistic activities and competitive, non-regulated activities to meet the increasing pressures of international competition. The need for innovative, competitive ability and new capital investment is in line with the objectives set forth in the Minister of Finance's 1984 agenda for economic renewal. Based on these objectives, studies are underway in DOC with a view to formulating a Canadian telecommunications policy. Other influential factors include written submissions from interested parties and the outcome of the CRTC's public hearings on inter-exchange held in the fall of 1984.

Besides competition, the role of cable, the Radio Act and policy options for the federal government's holdings in telecommunications are also under review.

On December 20, 1984 the Minister of Communications introduced Bill C-19 into the House of Commons. This legislation would confirm the basic obligations of Bell Canada, empower the Governor-in-Council to issue policy directions to the CRTC, alleviate regulatory burden and clarify the CRTC's authority to regulate the distribution of programming received from satellites.

4.1.2 *Regulations*

The CRTC has been very active in the period covered. Of particular interest to the telecommunications community are the CRTC's decisions on basic and enhanced telecommunications services and DOC's policy on cellular radiotelephone services. The status of each of these subjects follows.

Basic and enhanced telecommunications services: To clarify the distinction between services offered by regulated and non-regulated telecommunications vendors, the following definitions were issued by the CRTC (Decision 84-18, 12 July, 1984):

> "**Basic Service** - A basic service is one that is limited to the offering of transmission capacity for the movement of information. In offering this capacity, a communications path is provided for the analog or digital transmission of information of various types such as voice, data and video. Different types of basic services are offered depending on (a) the bandwidth desired, (b) the analog and/or digital capabilities of the transmission medium, (c) the fidelity, distortion or other conditioning parameters of the communications channel to achieve a specified transmission quality, and (d) the amount of transmission delay acceptable to the subscriber. Under these criteria, subscribers are afforded transmission capacity which suits their particular communications needs.
>
> "A basic service should be limited to the offering of transmission capacity between two or more points suitable for a subscriber's transmission needs and subject only to the technical parameters of fidelity or distortion criteria, or other conditioning. Use internal to the service provider's facility of companding techniques, bandwidth compression techniques,

circuit switching, message or packet switching, error control or other techniques that facilitate economical, reliable movement of information does not alter the nature of the basic service. Similarly, internal speed, code and protocol conversion that is not manifested in the outputs of the service does not alter the nature of the basic service. In the provision of a basic service, memory or storage within the network is used only to facilitate the transmission of the information from the origination to its destination, and the service provider's basic transmission network is not used as an information storage system. Thus, in a basic service, once information is given to the communication facility, its progress towards the destination is subject to only those delays caused by congestion within the network or transmission priorities given by the originator.

"In offering a basic service, therefore, a service provider essentially offers a pure transmission capability over a communications path that is virtually transparent in terms of its interaction with subscriber supplied information.

"**Enhanced Service** - An enhanced service is any offering over the telecommunications network which is more than a basic service. In an enhanced service, for example, computer processing applications are used to act on the content, code, protocol, and other aspects of the subscriber's information. In these services, additional, different or restructured information may be provided the subscriber through various processing applications performed on the transmitted information, or other actions, such as editing or formatting, can be taken by either the vendor or the subscriber based on the content of the information transmitted.

"Moreover, in an enhanced service, the content of the information need not be changed and may simply involve subscriber interaction with stored information. Many enhanced services feature voice or data storage and retrieval applications, such as in a "mail box" service. This is particularly applicable in time-sharing services where the computer facilities are structured in a manner such that the customer or vendor can write its own customized programs and, in effect, use the time-sharing network for a variety of electronic message service applications. Thus, the kinds of enhanced store and forward services that can be offered are many and varied."

One new basic service experiencing an increasing level of activity is the cellular mobile radiotelephone service.

Cellular mobile radiotelephone services: In October of 1982, DOC announced its policy concerning the introduction of cellular mobile radiotelephone services in Canada. Specifically, the department would provide licences for the operation of cellular mobile radio systems to the telephone companies in each of 23 metropolitan areas and to one national competitor to those telephone companies.

The cellular mobile telephone service is a public service that provides high-capacity radio communications between customer-provided mobile/portable radiotelephone units or between such units and the telephones connected to the public switched telephone network.

The service is provided by means of a single- or multi-cell configuration of base station equipment in which specific radio frequencies assigned to one cell of the system can be re-used in different cells within the cellular service area. It is this re-use of frequencies that enables the provision of more mobile channels to the public. Each cell base station is connected to a cellular switch which, in turn, is connected to the telephone network.

Continuity of service as a vehicle moves from one cell to another is achieved by means of a "handing-off" technique whereby calls are transferred from one cell to an adjacent cell.

Progress: Following an evaluation of proposals submitted to DOC for a nation-wide service, in December 1983 the department announced that it would issue radio licences to Cantel Inc. to provide services in competition with the telephone companies. July 1, 1985 has been established as the date on which the telephone companies and Cantel Inc. may commence the service.

The service is likely to be an attractive alternative to the use of private land-mobile communications where the traffic volume does not warrant a private channel, and to the present limited public land-mobile services offered by the common carriers.

There are immense economic and industrial benefits associated with the introduction of cellular radio services. This new industry is expected to generate worldwide revenues of $10 billion annually by 1990. The fostering of its inauguration represents one of the avenues used by DOC to fulfill its objectives with respect to new technology.

4.1.3 *Standards*

Terminal attachment standards development: Technical standards for terminal equipment attached to the Public Switched Telephone Network (PSTN) are developed by the Terminal Attachment Program Advisory Committee (TAPAC), which is chaired by DOC and includes the voluntary participation of carriers, manufacturers, suppliers, users, and provincial governments.

One objective of the program is to develop terminal attachment standards suitable for nation-wide adoption. Currently, TAPAC-developed Certification Standards are fully supported by the federal regulator, the CRTC, and officially adopted by some provincial regulators. In order to facilitate nation-wide acceptance of these standards, late in 1983 TAPAC was designated as the Canadian Standards Association (CSA) Technical Committee on Network Protection under the newly formed CSA Steering Committee on Telecommunications (SCOT). This joint committee is now charged with the responsibility of developing national standards for network protection aspects of terminal equipment attached to the public switched networks and is in the process of converting TAPAC Certification Standards (designated as CS-XX) into CSA standards, which will form part of the National Standards System of Canada.

During the fiscal year 1983/84, TAPAC published standards for terminals to be attached to the Teletypewriter Exchange (TWX) Services Network (as part of CS-03) and the Canadian TELEX Network (CS-05) in addition to the PSTN. A technical standard for cordless telephones has also been included in the latest issue of CS-03.

As Supplement B to the CS-03, technical requirements for terminal equipment attached to 1.544 Mbps DS-1 digital channels were developed (limited to point-to-point full DS-1 digital channels). At the time of writing, a technical standard for 64 kbps sub-rate channels on DS-1 lines, either point-to-point or switched, was on the agenda. This signifies the evolutionary trend of networks and terminal equipment from the analog environment to the digital world.

4.2 Socio-economic factors

As noted in Section C, the office equipment, telecommunications and computer technologies are on paths of convergence. The technology to accommodate integration is in place. What deterrents, then, are retarding its implementation?

Two impediments have already been examined - the lag of organizational changes behind the technologies and the difficulties in identifying and defining requirements. In this section the

concurrent impact of the converging technologies on labour, the workplace and the economy is examined as an additional constraining influence.

4.2.1 *Labour*

As the evolution in technology unfolds, its effects on labour are slowly emerging.

Over the past couple of years, through a number of reports and surveys, assessments have emerged from the Science Council, Labour Canada, the Institute for Research in Public Policy, DOC and other bodies. A mixture of pessimism and optimism prevails.

A shift in emphasis from hardware to software development and user-friendliness is favourable to the professional and senior income category. Skill changes, however, are required for both the managerial and operational segments of the workforce.

The advent of word processors appears to have resulted more in increased demand for word processing services than in reducing employment; applications programmers, on the other hand, are likely to be in less demand in the future as end-users take over the function, often using externally-provided applications packages. This is not expected to affect trained programmers significantly, however, until the modular environment is in place.

It should be noted here that the new technologies have produced both tedious, repetitious tasks and new opportunities for quality improvement and enrichment. By examining with a fresh approach job objectives and existing methods of achieving them, many employees will discover exciting new avenues of job enhancement. As these avenues are explored and developed, compensation measurement, job descriptions, categories and levels will require review and amendment. Meanwhile, the two-tier effect that favours professionals and senior management, but tends to diminish middle- and low-income jobs, seems to point to the requirement for better schooling and retraining for those prepared to rise to the challenge. For a perspective on potential opportunities, please refer to Appendix I - A Study on Employment Effects, which provides an extensive overview of the impact of information technology on the work force.

Trends in attitudes in the workforce show that workers are anxious to advance quickly and are willing to put maximum effort into the job. Private time, on the other hand, has become more important and is not sacrificed readily for higher salaries and promotions. A paper by Matthew J. Puleo, published in The Princeton Papers, entitled "The Uncommitted Worker," submits that there is a

tendency away from a commitment to work "for work's sake." Workers must feel fulfilled and this will be accomplished either through their jobs or - if the job is unrewarding - by means provided by the salary earned.

As of August 1, 1984, women comprised 42 per cent of the Canadian workforce, totalling 5.3 million. An American expert on women in the labour force, Aileen Applebaum of Temple University in Pennsylvania, reported in 1983 that employment growth is occurring in sectors where the majority of employees are female. The 1981 Canadian census, however, showed that 49 per cent of the female workforce was still concentrated in the traditionally female-dominated health, teaching, stenographic and clerical occupations which offer little chance of advancement and relatively low wages.

Appendix III - A Case Study in the Electronic Office - poses the question as to Customs and Excise employees' reactions to the hardware and software they are field-testing. Forthcoming evaluations of that and other Office Communications Systems field trials will address this concern.

4.2.2 *Workplace*

Since the development of the last Annual Review the "shape" of the federal government office has been significantly changed - and is predicted to continue to be altered as multi-functional terminals push away the mountains of paper that have typified the bureaucracy.

With the proliferation of terminals, health and ergonomics are gaining more attention. In the Spring of 1983 Health and Welfare Canada issued a report dispelling fears of radiation from Video Display Units (VDUs). Departments are now turning their attention to equipment design, lighting, eye fatigue, and other factors that affect an employee's productivity. Productivity has been found to be reduced by 25-30 per cent when word processors are operated without the ergonomically designed furniture intended to support the task.

Availability of portable terminals, coupled with design improvements, have made the transportability of workplace from office to home more practical. As this trend gathers momentum, central agency policy and guidelines will be required in the government to accommodate the shift. While attractive features accompany the availability of communicating office equipment in the home, there are also effects viewed as undesirable by the worker. For example:

- the workday tends to be continuous, beyond the close of office hours;
- the lack of social interaction is a negative factor;
- the types of jobs that can benefit are limited;
- mental stimulation is decreased owing to isolation.

4.2.3 *Economy*

Various sectors of the economy are emerging as beneficiaries of microelectronic technology, most prominently the service sector where the investment in technology is found to be twice as effective in increasing productivity as the more traditional forms of investment. However, cost justification remains one of the major obstacles to widespread implementation, both within and outside the public sector. Without standard and effective means of productivity measurement, it is therefore a significant impediment to the final integration of the technologies.

Productivity gains aside, the costs of implementing the new technologies will continue to rise throughout the '80s. Although the price of most hardware and electronic components will drop, expenditures on products and services will increase steadily on a constant-dollar basis.

New, multi-media office systems will be more expensive than the individual telephone, word processor and copier. These new office automation systems have a paradoxical nature. To become simpler to the user, they must become more technically complex. Furthermore, value added services, such as interactive programming tools and direct access to data bases, are generally wasteful of computing resources, since costly computer and memory functions sit idle while their companion services are in use. Software costs will therefore have to rise to accommodate the more sophisticated technology and higher salaries linked to the shortage of trained people.

The good news is that in the '90s modularity of design should ensure that information processing systems will never have to be replaced in their entirety. This will mean that programs and data bases will need to be machine-independent, movable from one module to another. As a user's needs change and new capabilities arise, the system will be adaptable accordingly.

Moreover, by then integrated high-speed networks should be able to combine users' communications requirements, permitting the advantage of lower unit communications costs.

In his book, Megatrends, author John Naisbitt sums up present society as follows:

> "We are living in the **time of the parenthesis**, the time between eras. It is as though we have bracketed off the present from both the past and the future, for we are neither here nor there. We have not quite left behind the either/or America of the past - centralized, industrialized, and economically self-contained. With one foot in the old world where we lived mostly in the Northeast, relied on institutional help, built hierarchies, and elected representatives, we approached problems with an eye toward the high-tech, short-term solutions.
>
> "But we have not embraced the future either. We have done the human thing: We are clinging to the known past in fear of the unknown future."

One thing is certain: the success of the converging technologies is implicitly dependent on people. Can we adapt? Do we want to adapt? Is it useful to adapt?

Based on the past, the answer to the first question has to be "yes." Even if the older generation has difficulty, they will be replaced by the young who are being trained today from pre-school age.

The second question is not so easy; to date, the answer has qualifying clauses. We will want to adapt, for instance, if the process of accommodating the new tools does not alter the end-user's behaviour such that it interrupts daily work.

As for the final question, that answer depends on one variable: will the technology or the end-user be the catalyst?

4.3 Technologies

In terms of leisure activities, the name of the game during the 1980s may well be Trivial Pursuit. In technology it is "enhanced services" and there is nothing trivial about its development.

Another way of talking about the converging technologies, enhanced services today represent the industry's fiercest area of competition. Their rate of diffusion into the market, however, may be hampered as much by a degree of uncertainty surrounding potential suppliers as by the state of unreadiness in the office. Although regulators can decide which carriers will provide the services and what facilities may be attached to the carrier's system, they at present control only the interface requirements for network protection and do not regulate other specifications of LANs or PBXs through which, together with the public network, these new services are made available. Nor can they regulate the organizational changes needed in the office.

Supplemented by other research, the following paragraphs represent the findings of a study conducted on behalf of DOC to discover which enhanced services will develop over the next ten years (from 1983) and at what rate they are likely to grow. The study was carried out by Douserv Telecom Inc., a Montreal-based firm, and reported in November, 1983 under the title Final Report - An Economic Analysis of Enhanced Telecommunications. It confirms this review's thesis that the trend for the next decade is clearly towards the multi-format integrated services:

> "Converging developments in this direction are coming from three directions. The computer industry with multifunction micro-processors, the telecommunication industry with multi-function terminals and the office equipment industry with Computer-Aided Design (CAD) systems, word processors and copiers rapidly becoming multifunctional and with communicating capabilities. (Convergence) will be made possible by digital local area networks and third generation PBX's which provide full integration of audio, text and even graphic formats in a digital transmission signal. Other technological innovations permitting reduction of video into a 1.5 Mb/s signal or less will make possible enhanced video + audio + LSDS (low speed data services) at an affordable cost. When combined with satellite transmission, the economic benefits will be particularly significant over long distances where travel costs are rising."

4.3.1 *Identification*

For definitions of "basic" and "enhanced" services, refer to paragraph 4.1.2 of this section.

The basic information formats can be identified at the user level as text (which includes and is used as synonymous with data), graphic, picture (including facsimile), audio, slowscan video and video.

The enhanced services are represented through two additional dimensions:

Format Mix - This is the simultaneous use of more than one user format in a given communication transaction such as voice and text. For convenience, the combinations of user formats integrated into a single communication transaction are grouped as follows:

- Text (data) with graphics and/or picture and/or slow-scan video is text enhanced with other basic formats which, like text, are "communicated" by low-speed data transmission. Therefore, as

far as the telecommunications network is concerned, these information formats are equivalent and can be grouped together in one set referred to as LSDS (Low-Speed Data Service).

. Text with the same additions as above to which video is added. This grouping is referred to as LSDS + Video.

. Audio + LSDS.

. Audio + LSDS + Video.

Format Translation - The other dimension consists of the translation of one format into another, such as voice to text (speech recognition) and text to voice (voice synthesis).

As reported by Douserv Telecom Inc., a summary of basic plus enhanced services available in 1983 and expected to be available by 1993 on the public switched network in Canada is shown in Figure 1.

4.3.2 *Demand measurements*

The following outlines the actual and predicted demand for the elemental surrogates of enhanced services.

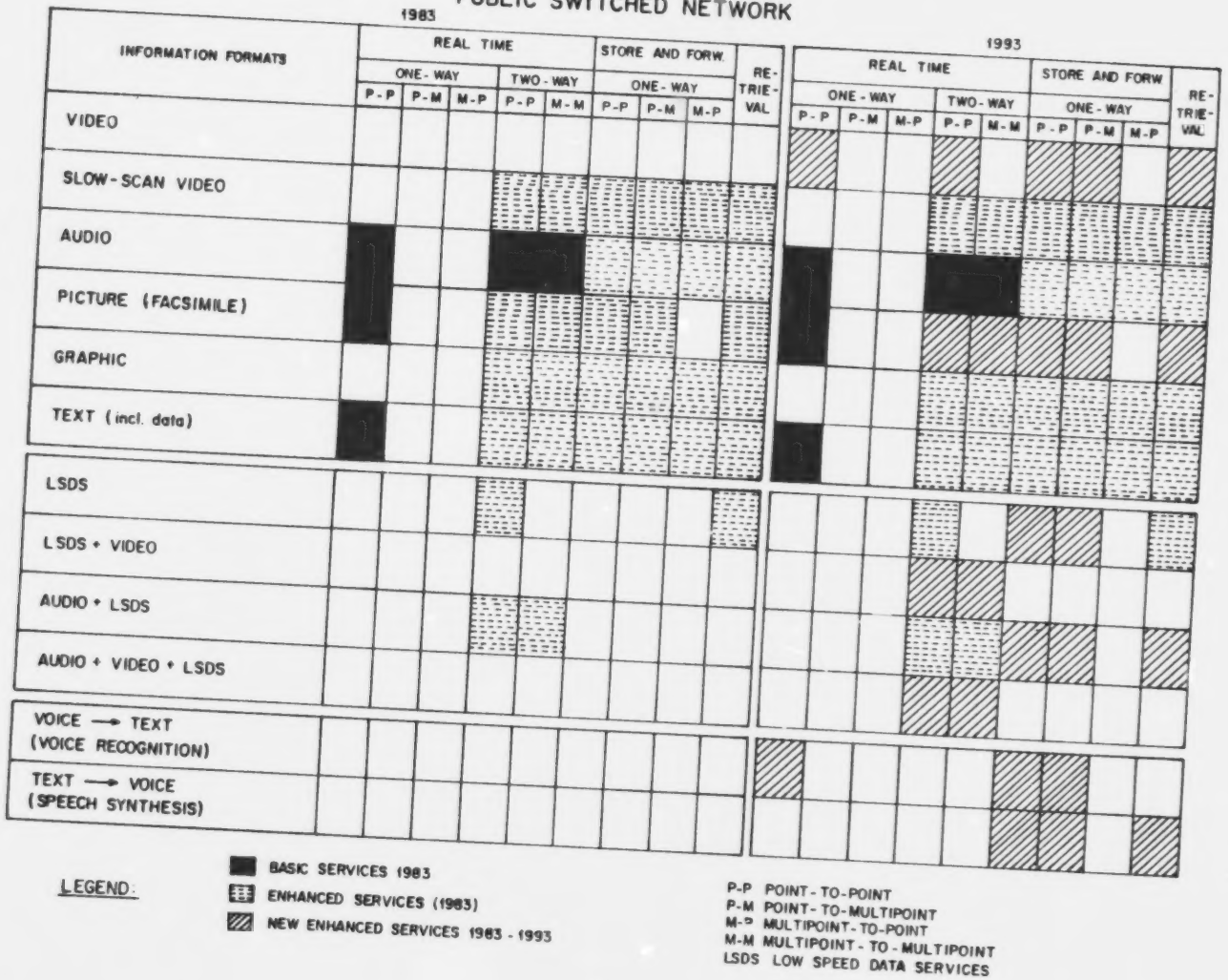
Word processors: The Toronto-based firm, Evans Research Corporation, predicts that the number of total systems (stand-alone and multi-terminal) will peak at 19,400 in 1985, thereafter declining to 17,800 in 1986 and 13,300 in 1987. This decline is certainly attributable to migration of the word processing function to multi-functional terminals.

Electronic messaging: Industry is presently involved in long-range planning for electronic messaging. Integration of voice with electronic mail service will provide voice-based messaging features along with text messaging. These developments will come in stages and will take place within the next three to seven years. (See also the following paragraph on voice message services.) As electronic mail increases, there will follow a proliferation of low-cost, lightly-used terminals.

Image: R.W. Hough and Associates estimated that in Canada there were approximately 8,000 facsimile terminals in 1978 and that in 1985 their number will have grown to 28,000. Industry is conducting staged research on the integration of facsimile transmission with electronic messaging, targeted for implementation in the last half of the decade.

FIGURE 1

BASIC + ENHANCED SERVICES
PUBLIC SWITCHED NETWORK



LEGEND:

- BASIC SERVICES 1983
- ENHANCED SERVICES (1983)
- NEW ENHANCED SERVICES 1983 - 1993

P-P POINT-TO-POINT
P-M POINT-TO-MULTIPOINT
M-P MULTIPOINT-TO-POINT
M-M MULTIPOINT-TO-MULTIPOINT
LSDS LOW SPEED DATA SERVICES

By means of digital transmission capabilities and the built-in diagnostics possible with semiconductors and microprocessors, image distribution systems are advancing from the typically low speed of six minutes per page. The following range of speed groups has been standardized by the International Telegraph and Telephone Consultative Committee (CCITT): low (six minutes), medium (three minutes), high (one minute) and very high (less than 10 seconds).

Video disc technology should become widely used in office file servers. By the late '80s electronic cameras and converters for encoded material should be in general use. Mixed-media storage systems, requiring high data rates for the communication of image material, will be in delivery. Communicating laser printers will share printing and copying functions and serve as high-speed image transmitters and receivers.

Tele/videoconferencing: Still constrained by carriers' inability to offer wide-band communications at acceptable cost, teleconferencing will benefit, however, by the use of high-speed video links. Equipment costs will remain formidable until the late nineties, so most users will invest in specially-equipped videoconference rooms with dedicated lines to the local carrier's switch.

Voice message services: In the United States this market should reach one billion dollars in 1985 and three billion by 1990. Present usage of this service in Canada is almost negligible, however long-range plans are being developed to provide voice-based messaging features along with text messaging. This technology would allow users who are away from their desks without portable terminals to have their messages read to them over the telephone. To access the electronic mailbox and have their messages read by the computer's voice, they could key a certain sequence of digits via a touchtone telephone or even speak their name and password into the system. The computer would then transform the text messages into voice messages. Work in this area is progressing rapidly, and this feature should be available in the late 1980s.

Speech recognition: Development of speech recognition systems is still in its early stages. Greater processing power to perform the speech processing and pattern recognition operations is required to advance the technology beyond the handling of a few hundred words. Efforts to improve the power of such systems will demand greater understanding of the acoustic-phonetic features that can be extracted from speech, better modelling of speech signals and spoken language, and cost reductions in computer power and memory. Useful applications of the technology in its more advanced form will include telephone order entry services, inquiry

answering and certain data entry situations. Unconstrained continuous speech recognition systems are not expected to become available, however, during this decade and may not be developed before the end of the century.

Land Mobile Radio: Spurred by the impact of cellular radio (described in E.4.1.2), this technology is advancing rapidly, accompanied by approaching low prices. While this service has been limited in scope within the government, demand may soon rise in response to the low-cost trend.

Modems: One measure of the desire to connect to the outside world is shown in a Frost and Sullivan study of modem growth. The market expectations show a tripling in growth from 1981 to 1986, with the market in 1985 at one billion dollars and principally driven by the demand for 1200 BPS modems. This presupposes the continued need for analog-to-digital and digital-to-analog translation.

Modems and multiplexers continue to benefit from advances in semiconductor technology; that is, they are smaller, intelligent and capable of 16 or 14.4 KBS over voice-grade lines rather than the traditional 2.4 KBS.

Microprocessor-based modems are integral to network management schemes. They monitor their own performance and that of attached communications lines and terminals and can also isolate transmission problems to a particular line, modem or device. These capabilities require the establishment of user network control centres to ensure the reliability of on-line systems.

Personal Computers (PC): The personal or desktop computer (microcomputer) is the product experiencing the highest growth in the data field. An American study estimates that the 1982 base of approximately 2.5 million units will grow to 20 million units by 1987. A substantial number of these are likely also to employ facilities that connect to centralized data bases, tie into local mainframe computers, and talk to other computers. This will spur on the need for sophisticated networking and in turn hasten the development of enhanced services. By 1985 the number of PCs with modems was predicted to increase to 4.5 million in the United States.

Data bases: The degree of availability and attractiveness of data bases will be the major factor in the growth of enhanced transmission facilities to handle the connection of microcomputers to data bases.

A 1983 article by R.D. Sloanne, the president of TransCanada Telephone Systems (now Telecom Canada), indicated that a recent survey found more than 500 publicly available data bases in Canada

and predicted an annual growth of 20 per cent until 1990. In addition to the numerical growth, the extent of coverage and depth of the data bases will also expand.

Multifunctional workstations: By 1987 complete integration of most terminal, word processor and desktop computer-type workstations will be accomplished. Typical devices will incorporate relatively high resolution color graphic capability and read-only video discs. Prices will decline to within the $300-$700 (constant dollar) range for simpler models. Those offering higher resolution displays and costly peripherals will still cost several thousand dollars.

Between 1987 and 1992 user workstations will be able to inter-operate with a wide variety of dedicated and public networks. They will be able to perform equally data entry and enquiry, text processing, stand-alone computing and image processing. Combined with high-resolution graphics, extensive computing and dedicated storage capacities, these capabilities will lead to individual libraries and procedural tools to act as the user's "personal assistant."

Switches: Fourth generation PBXs, with capacities of the order of 4.4 billion BPS and channels between devices in the megabit range, are designed to support total office functions and to integrate local area networks. As such, they have the capacity to act as the central hub of the automated office and are increasingly attractive for LANs, as they can use the copper wiring already in place. A Computer-to-PBX Interface (CPI) should be available in 1986.

Intelligent processors: A Frost and Sullivan study of the American market for intelligent processors (front-end data switches, multiplexers and concentrators) shows a growth from $3 billion in 1982 to $12 billion in 1987. The report cites that the major application has been to cut communications costs, but that the office automation market will be responsible for a substantial part of the growth in such areas as electronic mail, voice storage, and interconnected word processors. New systems will tend towards the use of multiple microprocessors in information appliances of all kinds. Modular in design, they should be easier to use and less costly to maintain.

Local Area Networks (LANs): The world-wide market for LANs was expected to grow at a compound growth rate of 28.6 per cent over the next six years from an installed base of 8,160 in mid-1982. By 1990, a Venture Development Corporation study predicts there will be a market for 1.18 million nodes. (A node is defined as a

cluster of peripherals such as eight terminals, eight microprocessors or one computer.) One-third of the 136,000 nodes existing in 1983 were used for office automation applications. The LAN concept is considered to be the major breakthrough needed for the integration of various information processing functions. It is also considered to be the key to increasing the convergence between word processing and data processing.

Integrated Services Digital Network (ISDN): The effects of the extremely varied terminal demand on networks indicated above are forcing network designers to provide for the integration of services. Given the irrevocable trend from analog to digital networking, integration is clearly going to occur through digitalization. In fact, Telecom Canada plans to inaugurate an integrated services digital network in 1990. The user needs described in section C.5 are leading forces behind its development.

The aim of such a network is to offer a mix of capabilities to handle voice, data, facsimile and video. It will consist of three major network components: integrated access, adaptive links and integrated switches.

- Integrated access provides a standard interface for all data speeds and services, thus eliminating the distinct interfaces required today for voice and data traffic. The network will determine the most efficient way to handle the call. Likely users will have access to 64 KBS channels for voice and bulk circuit-switched data and 16 or 64 KBS channels for packet-switched data, including integrated signalling. This will allow users to gain access to inter-active connections.

- Adaptive links consist of a "digital pipe" with digital transmission facilities that will be able to handle any type of traffic with multiple bit rates and dynamically allocated channels, including T1 Carriers and digital radio.

- Integrated switch is a single switch incorporating both circuit- and packet-switching capabilities. It determines the most effective method for each communication, and will simultaneously handle voice, data and a variety of special features. It utilizes distributed processing in a fibre-linked modular design. Fibre optic links are used to provide fast communication of both voice and the internal control messages that today are packet-switched.

4.4 Government Research and Development (R&D)

The federal government's initiatives in telecommunications research and development are basically concentrated in three areas: university research, joint trials with industry and carriers, and

in-house research. These are expanded upon below in terms of 1) university research projects initiated and funded by DOC; 2) office communications field trials sponsored in conjunction with industry; 3) the Mobile Satellite Program jointly undertaken with Telesat Canada; and 4) DOC research on optical communications and electro-optics.

4.4.1 *University research*

Since 1971, DOC has maintained a special fund to finance university research relating to its mandate and to the responsibilities and priorities of the federal government. In 1978 the French-Language Centres of Excellence Development Program was created, following a language-profile study of universities funded under the University Research Program. The program encourages research in the cultural or communications fields by francophone universities and develops teams of skilled scientists and technicians in areas of interest to the department.

The research projects are undertaken in fields that support federal government priorities in the areas of communications technologies, systems and networks, and the social and economic aspects of culture and communications. The projects complement various research activities undertaken by the department and help train experts in fields relating to the department's activities. The participation by a broad cross section of Canada's post-secondary institutions highlights the strong spirit of co-operation between the government and university sectors.

In 1983/84 the department awarded 56 university research contracts totalling $1,169,000 to 28 Canadian universities and colleges. Forty projects, totalling $819,000, were approved under the University Research Program, while 16 others, with a value of $350,000, were approved for the French-Language Centres of Excellence Program.

The University Research Program has allocated approximately $174,000 to projects in the Atlantic provinces, $218,000 in Quebec, $278,500 in Ontario, $23,000 in Manitoba, $27,000 in Saskatchewan, $38,500 in Alberta and $60,000 in British Columbia. Under the French Language Centres of Excellence Program, $39,000 was allocated to New Brunswick, $286,000 to Quebec and $25,000 to Ontario.

One of the major research projects is a joint contract for $80,000 to three universities - Montreal (Quebec), Mount St. Vincent (Nova Scotia) and Queen's (Ontario) - to evaluate the impact of office communications systems. Some of the projects focus on cultural questions or on new technologies, while others examine communications systems and networks or study the socio-economic effects of communications technology.

The following two research projects, commissioned on behalf of GTA, were carried out in 1983/84:

Development of integrated communications network topology - For the past two years, Professor Sheng and Dr. Alam of the University of Windsor, School of Computer Science, have been undertaking a series of studies aimed at determining a methodology for selecting the optimum mix of telecommunications facilities that would minimize the cost of the government IX network. In the 1982/83 contract the research specifically addressed the arrangement of government terrestrial facilities and the public network.

As a continuation of this work, the 1983/84 research contract was directed at studying the techniques for mixing government terrestrial and satellite facilities in an overall network configuration that would meet the full traffic requirements at minimum cost. This has been achieved, and computer programs are now available to further extend the analysis to other more complex arrangements. A comprehensive report on the results of the research was completed and is proving to be of considerable value to GTA in answering critical design questions concerning the implementation and viability of satellite communications in the government.

Impact of satellite use for data communications - This study, implemented at the École polytechnique de Montréal, addressed the impact of satellite communications networks on government data communications. Following the introductory sections on the general properties of various satellite access techniques, it provided an up-to-date summary of specific channel access techniques for data and mixed (data and voice) applications.

Using government data traffic patterns, the report made recommendations for access techniques for various types of categorized data traffic.

The study report also included a section on security and related issues, as well as an extensive bibliography on all of the aspects of satellite communications addressed.

4.4.2 *Office Communications Systems (OCS) field trials*

Phase II of DOC's $12 million program was moving into its final stages at time of writing. Scheduled for completion in 1985, this research initiative is designed to enable the Canadian office automation industry to prepare itself to satisfy the huge potential market in Canada and abroad. At the same time it is examining the effects of office automation and studying how technology can make offices more productive.

Four firms and Mount St. Vincent University in Halifax have been selected to conduct the impact assessments, which will be comprehensive. They will examine the performance, reliability and ease of use of the hardware and software for each trial, the reactions of people using the equipment, human and social factors, including job satisfaction, health effects and implications for privacy and security, effects on organizational structure and function, and effects on productivity.

The following is a progress report on the five trials taking place in government departments:

Department of National Defence/Systemhouse: This field trial involves both headquarters and field organizations, financial policy and financial administration. With up to 130 workstations, it is the largest such operation ever tried in Canada.

The trial addresses eight different office problems:

- creation and distribution of documents,
- indexing and access to stored information,
- communication and control of information,
- administrative support tools,
- computation and modelling techniques,
- presentation of information,
- control, dissemination and amendments of policy and procedure manuals,
- automated decision-support systems.

The workstations have video display terminals with varied degrees of intelligence adapted to need, all having the potential to be linked to local and remote networks, which in turn give access to remote data bases and remote host computers. Communications are by Datapac and Dataroute.

Since this field trial experienced difficulties in developing some of the software, the project was given an extension into 1985-86. The impact assessment will be completed late in 1986.

Environment Canada/Office Communications Research Associates (OCRA): The most general of the series, the trial in Environment Canada is being carried out in two phases. The field trial phase began in early 1984. Workstations with access to electronic functions are able to perform the following range of tasks in an integrated way:

- electronic mail and messaging,
- activity management,
- electronic file management,
- administrative support,
- decision support,
- word processing,

- voice communication,
- graphics,
- training,
- project management,
- correspondence tracking.

Located both at headquarters and in the regions, the workstations support a wide range of tasks in policy, procedures, administration, facilities planning and communications. Both telephone lines and coaxial cable are used for transmission.

If the trial proves successful, strategic plans allow for expansion to a department-wide system over five years.

Revenue Canada (Customs and Excise)/Bell Northern Research (BNR): This trial is aiding the development of an integrated electronic office system. Initially, two digital PBXs, one in Toronto and one in Ottawa, were installed to support 100 workstations, half in each city, which provide electronic messaging, advanced telephone service, personal filing and report production. Expansion will take place if the trial is successful.

The workstations installed by Bell Northern Research are Displayphones for managers and VT-100 VDUs with SL-1 telephone sets for knowledge workers and support staff. They are connected to the SL-1 PBX switch to access remote host systems and to permit electronic mail and messaging. The equipment combines voice, text and data in ways that allow employees to communicate with one another and get information easily. The project is studying and testing functions that tend to be similar in all offices: the creation, transmission, filing and retrieval of documents, meetings and conversations. Emphasis is not only on the testing of equipment, but on the educational value to a large employer seeking higher productivity.

A detailed account of this field trial appears in Appendix II.

Department of Energy, Mines and Resources/Officesmiths: The smallest field trial, at Energy, Mines and Resources, is focused on a single function: policy and procedure manuals. Officesmiths is developing a methodology to manage and disseminate documentation on policies and procedures and to facilitate access to it. If the trial is successful, policies and procedures on the official languages, personnel and finance will be incorporated into the system. As the trial moves into the operational phase in mid-1984, departmental staff continues to receive training and advice from the company.

Test results should reveal that the time spent by managers and professionals in finding, interpreting and applying policies and procedures is cut in half. Although the software is tailored to meet the specific needs of the client, Officesmiths estimates that 80 per cent of it would be easily applicable to the automation of policy and procedure manuals across the federal government.

Department of Communications/Bytec-Comterm: The field trial in DOC, which got underway in 1984, is intended to test office communications systems with knowledge workers. Supporting the Policy Sector's major business activities, the following functions are provided:

- text processing (to create, revise and print narrative and numerical information),
- Telidon (to create, store and display graphic information),
- electronic spreadsheet (to create, revise and print statistical information),
- logging and tracking (to monitor the progress of documents through the approval cycle and to produce management reports from logs),
- electronic messaging (to transmit documents and messages throughout the workstation population),
- communication and remote terminal access (to provide access to relevant electronically stored data and to support users remote from the main site).

Public Works Canada and the Public Archives will be participating in the assessment of this trial. Public Works are concerned with such issues as workstation and space design, acoustics, heating, lighting, and air circulation, as well as questions related to the actual building infrastructure. They will provide DOC with a number of Functional Diagnostic (FUNDI) units as the research instruments to assess the environment at the user level.

Public Archives will be assessing the impact of office automation on policies and procedures with respect to the management and archiving of machine-readable information. The trial will also give them an opportunity to assess, for Access to Information legislation, the consequences of information created, transmitted and archived in machine-readable form.

4.4.3 *Mobile Satellite (MSAT)*

Background: The MSAT Program of the Department of Communications is aimed at supporting Canadian industry to develop and establish a first-generation commercial mobile-satellite (MSAT) system and service for Canada by 1990. The MSAT system would provide voice and data communications to vehicles, aircraft, ships and other portable stations located anywhere in Canada for a wide variety of

applications such as resource exploration, trucking, railways, forestry, fisheries, construction and law enforcement. The two-year MSAT Program Definition Phase (Phase B) has recently been completed at a cost of $17.4 million. This involved comprehensive studies on market demand, commercial viability, system concepts, and economic benefits as well as technology development. The major thrust of Phase B was to develop co-operative arrangements with industry to commercialize MSAT at the earliest possible date. The results are very encouraging for the development of an MSAT system.

Commercialization of MSAT: In February 1985, Telesat Canada submitted a proposal to the Department of Communications seeking government support to establish a commercial MSAT system with provision for co-operative arrangements with an American mobile-satellite operator. In March 1985, the Minister of Communications announced conditional federal government support for the implementation of the MSAT system, that is, approval for Phase C/D of the program subject to full funding approval later in 1985. This approach has resulted in a commercially-led satellite system rather than a government demonstration system as originally envisaged by DOC and NASA.

To date, 12 companies have submitted applications to the FCC to develop a similar mobile-satellite system in the United States. NASA is planning to offer a satellite launch to an American satellite operator in exchange for capacity for experiments. In Canada, DOC plans to offer satellite capacity to potential users for trials and to experimenters. These would be conducted after the planned MSAT launch in 1989 to maximize early market penetration by allowing potential users to make viability decisions. Prospective participants in trials and users of commercial MSAT services include federal government departments; provincial governments and a large number of companies involved with such matters as transportation, natural resources, safety, exploration, sales, manufacturing, utilities and aviation. Some 170 proposals for trial have been submitted to DOC.

MSAT Implementation Phase (C/D): Approval by Cabinet for this phase includes expenditures for fiscal year 1985/86 of $6.7 million. Major objectives for Phase C/D during fiscal year 1985/86 include the further examination of risk-sharing options with Telesat Canada; business arrangements between Telesat and Canadian service providers, suppliers and with American industry; further commitments by Telesat, service providers and industry; a DOC-NASA Memorandum of Understanding for co-operation on mobile satellite service and technology developments; a DOC-FCC agreement on spectrum sharing; an industry plan to develop and manufacture MSAT products and meet sales objectives in domestic and export markets; and further proof of concept for outstanding technology items required for the commercial MSAT system.

4.4.4 *Optical communications and electro-optics*

Local Area Networks: Fibre Optic Local Area Networks (FO-LANs) are high-capacity, short-haul, non-proprietary communications networks based on optical communications and electro-optics technology that allow a multiplicity of different terminal devices, such as personal computers, to communicate (provided these devices are designed to adhere to a commonly accepted interface standard). Such networks can function in packet-switch mode (a packet switch is a device that acts just like a circuit switch by providing a logical communication channel between any two network access points) or form an integral part of a PBX communication system. Applications of FO-LANs exist in multi-tenant structures such as office and apartment buildings, automated factories and hospitals, in traffic control systems, on board ships, in aircraft and in automobiles. Installed in multi-tenant structures, for example, FO-LANs address the need for modular, high-capacity, flexible networking functionally designed to permit the ready addition of communication devices to the network and the alteration of the mix of services at any time and without interruption of on-going services. Ordinary LANs are designed to use metallic conductors, such as coaxial cable, as the transmission medium. However, the use of fibre in FO-LANs for communication between devices connected to the network is comparatively more attractive when services such as high-speed data carriage are to be provided, and is particularly compelling for the implementation of broadband communication services. Advanced optical communications and electro-optics technology, optimized to provide high-speed capability economically, is required to implement broadband FO-LANs, just as it is needed for high-performance point-to-point optical communication links.

CRC has developed very basic and important optical communications and electro-optic technology, recognized and used world-wide, that facilitates the implementation of fibre-based LANs. The contributions have centered on the devices needed to structure FO-LAN network nodes of almost any level of complexity and on innovative FO-LAN network topologies that allow controlled design tradeoffs for performance optimization and economy of operation. The electro-optic technology has been protected by Canadian Patents and Development Limited (CPDL) and has been licensed to Canadian and foreign companies.

DOC, in co-operation with DND, has developed (by contract to Canstar Communications) a prototype 32-port FO-LAN based on multimode fibre, using CRC technology, that permits communication between 256-terminal devices (see Figure 2). Plans are to develop a single-mode fibre version of the network that will have capacity limited essentially only by the speed of the electronics in the terminal devices connected to the network.

The University of Toronto, with support from the National Science and Engineering Research Council of Canada under a Project Research Applicable in Industry (PRAI) grant and with industrial backing from Canstar Communications, is designing an advanced version of a proprietary fibre-based network named "Hubnet," with a nominal throughput of 50 Mbits/sec. Canadian telecommunications companies and other universities in the nation are also active in FO-LAN research and development. A major Hubnet installation is planned for Manitoba.

Broadband FO-LANs are projected to be available commercially by 1990 at a cost per installed access port in the $2,500-$5,000 range. First generation FO-LANs of lower capacity are currently available from several sources.

Switching: Optoelectronic switch arrays were first proposed and demonstrated at CRC. Work has proceeded to investigate the novel capabilities of this approach to broadband switching for potential application in advanced communication networks. The research program has led to the fabrication at CRC of integrated broadband switch arrays in GaAs, to the demonstration of subnanosecond switching and multigigahertz bandwidth in optoelectronic cross-points, and to novel applications of broadband switches in signal processing. Ongoing work seeks to miniaturize the switch arrays and forms the primary research goal of the integrated optics activity at CRC.

The potential of optoelectronic switching for broadband communication networks has been perceived in a number of laboratories around the world, and in some countries demonstration optoelectronic switch arrays have been built. The basic work carried out at CRC is protected in several patents held by CPDL, and certain optoelectronic switching technology has been transferred to Canadian industry. Current prospects for the technology are in on-board switching in Time Division Multiple Access (TDMA) satellites, and in large scale centrally switched broadband analogue or high rate digital networks on coaxial cable or optical fibre. Such advanced networks are now being proposed in several countries.

5. Administrative practices

It is the policy of the government that the administrative practices related to the management of telecommunications resources be applied in a consistent and effective manner.

The irony during spurts of change, such as the current one brought about by the convergence of technologies, is that at the very time administrative guidelines are most needed, they themselves are in need of change. While this phenomenon may be inevitable, its

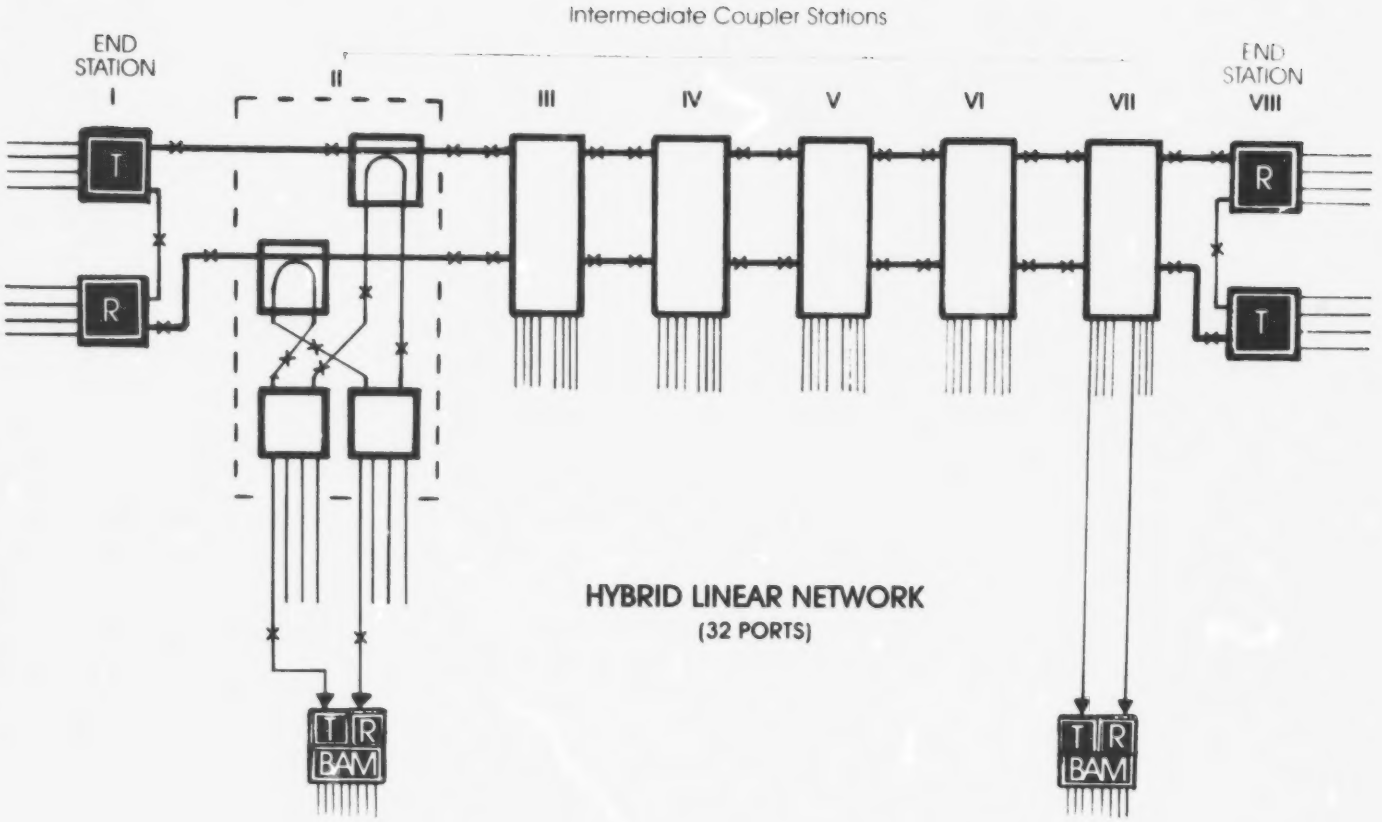

Intermediate Coupler Stations
END STATION I
II
III
IV
V
VI
VII
END STATION VIII
T
R
R
T
T R BAM
T R BAM
HYBRID LINEAR NETWORK
(32 PORTS)

FIGURE 2

impact can be moderated by streamlining the mechanisms for development and promulgation. This portion of the review presents an update and projected requirements related to the development and promulgation of administrative practices.

5.1 Update

5.1.1 *Practices on consolidations*

The use of programmable digital switches at the core of telephone service consolidations and the liberalization of government regulations have generated an urgent need for changes to the administrative practices pertaining to local telecommunications services. Accordingly, interim directives, standards and guidelines that should assist departments in dealing with telecommunications services within the context of the current environment were published as a new Subject in the Telecommunications Management Manual (TMM).

The modified practices take into account the new features that can be provided by the intelligent programmable switches and the new attachment options available under the new regulations. Also included are telephone service standards based on these new features. While the administrative practice focuses on telephone service, it does recognize the potential of the new digital switches for handling data communications requirements. The underlying principal criteria in the selection of service are the needs of the user, compliance of the service to those needs and cost-effectiveness - in that order.

5.1.2 *The Telecommunications Management Manual*

The TMM has received wide support as a useful compendium of directives and guidelines, stemming from various authority levels, which are necessary in the management of telecommunications services. The most important development in regard to the status of the TMM has been the proposal to consider its adoption as an effective document for the dissemination of telecommunications practices.

Telecommunications policy and government-wide guidelines in the area of telecommunications management would continue to be published in Chapter 435 of the Administrative Policy Manual, a copy of which would be included as an annex to the TMM. Section 3 of the TMM would contain the directives and guidelines in regard to government telecommunications services. Section 4 would be reserved for policies and procedures internal to each department or agency.

5.2 Projected requirements

5.2.1 *Long-term problem*

The speed and surprises of technological advance in the area of information technologies have made it difficult to maintain the relevance of related practices. The convergence of technologies is adding a new dimension to the problem by forcing a co-ordinated approach to implementation. Integration ultimately means significant changes not only to the procedures but also to some organizational structures. In the meantime, guidance must be generated to deal with the problem of acquisition, under segregated procedures, of facilities and services that are becoming more and more functionally integrated.

5.2.2 *Conceptual solution*

Because of the iterative nature of the technological convergence, where a perceived need promotes design of new technological applications while new applications stimulate a redefinition of needs, the community is going through a phase of exploration.

In the emerging office environment, the main unknown is the extent and rate of acceptable change in office methods and procedures, which is more difficult to predict than technological change itself.

The most appropriate approaches in such a phase are those which do not stifle prodding in many areas, yet enforce a co-ordinated move in the same general direction.

This requires even more extensive co-ordination between the users and the planners of information handling services than is required in the more stable phases of the evolutionary development cycle.

In the absence of one clear-cut service agency that encompasses all aspects of information technology, co-ordination can be achieved through committees and through co-operation between departments and service organizations. In the long term, organizational adjustments within departments and among service agencies should be under active consideration.

5.2.3 *Organizational change*

Organizational change in the environment of technological convergence must be explored systematically and cautiously. Within the objective of moving towards functional integration, it must be recognized that the cumulative scope of the disciplines behind the technologies involved remains as broad as before, thus posing,

together with other factors to be discussed in subsequent paragraphs, considerable challenge in arriving at a balanced solution.

The forces towards organizational integration stem from the need for rational development and management of information systems. System design and evaluation cannot be done properly without considering the information processing as well as handling components of each option. The flexibility of design available in the present and future environments opens new opportunities for improving information systems at a relatively low cost, provided the development process incorporates expert integrated analysis of the factors related to the three participating technologies. Correct decisions on the degree of centralization, and present and future compatibility among processors and networks are only a few of the considerations that are vital in this process and will require a co-ordinated effort.

Theoretically, functional integration could be best achieved through organizational integration; however, there are important opposing factors that must also be considered. While there is an inextricable interrelationship among the elements of information systems, each one of the traditionally distinct technologies extends well beyond that common area. Therefore, if organizational integration is contemplated, it must occur at a high enough level to ensure that its position in the overall structure is commensurate with the expanded functional scope. Also, if the corporate skills and knowledge are not to be diluted, functional specialization must be fostered, probably along the lines of the present skill and knowledge clusters, though not to the preclusion of enlightenment in the two areas of non-expertise.

Current developments also point to some changes in the required management approach. Management and system development in information processing tends to be application-based and program-oriented. Data base management is centralized or distributed according to the data sources and information users. Control is generally bureaucratic in that it is largely done through standardized protocols and procedures. Telecommunications networks, on the other hand, are developed on the basis of total requirements by location, and type and volume of traffic. Certain aspects of end-to-end management must be centralized to ensure that the various transmission media (for example, landline, satellites and radio) are used in the most efficient combinations and that provisions are made for suitable interface among different networks. In view of the technological development towards integrated digital network services, the extent and quality of centralized network management will have to expand. Only by effective management will it be possible to ensure that network design dynamically tracks the needs of systems users, thus

yielding economies in telecommunications, which is projected to be the most expensive component of future information systems. This seems to indicate that matrix (project) management might be extended into functional (or nonproject) management, thus by-passing the traditional hierarchical chain of command to feed expertise into the areas where it is required.

Other than some reflection on the factors that need to be considered, it is beyond the scope of this annual review to prejudge the long-term direction of organizational change. That direction should take shape through re-examination of objectives to learn what needs to be done and to devise a fresh approach to how to doing it. The organization that emerges should be equipped to provide the services needed at the required grade of service and the best price.

5.2.4 *Proposed managements principles*

Pending organizational and procedural adjustments as convergence of technologies matures, the following principles, which are independent of organizational structures, are presented for consideration:

- A "requirements" approach should be taken in the design, acquisition and use of office, EDP and telecommunications facilities.

- Acquisition of services that are cost-effective on a modular system basis, rather than on isolated portions of a system, should be promoted.

- Planning is a response to policy. The level of detail of planning should correspond to the appropriate hierarchy of authority, moving from the general towards the specific.

The linking of departmental policy and authority levels would promote faster response to opportunities for increasing effectiveness and efficiency.

5.2.5 *Changes to promulgation mechanisms*

In light of the essential characteristics of future direction and functional convergence resulting from the converging technologies, some changes may be required in current practices and procedures.

The proposal mentioned in 5.1.2, to incorporate more telecommunications administrative practices into the Telecommunications Management Manual is a step in the right direction.

5.2.6 *Training*

A very important, but too frequently neglected, aspect in the environment of converging technologies is training. Regardless of how effective a new system may be, it cannot function properly without the appropriate interface with people, both those who use the system and those who operate it. Because of the speed of change, it is not realistic to expect that staffing, in the course of normal turnover of personnel, will provide adequate opportunities to inject into the organization people with the required new skills and knowledge. For this reason, as well as the employer's moral responsibility to retrain employees displaced by automation, much more emphasis must be placed on in-house acquisition of required skills and knowledge.

Because the need for telecommunications training is pervasive but the capabilities for providing it vary dramatically depending on the nature and size of each department, mechanisms need to be developed which will facilitate equitable sharing of existing and newly developed training capabilities within the government as a whole.

To develop a method of delivering the most cost-effective training to meet common requirements of departments, detailed common needs for telecommunications training must be defined and the best means for meeting those needs must be found. A co-operative approach is supported by the following considerations:

- there is a significant component of required telecommunications knowledge that is common to many departments;
- centralized acquisition of training would take advantage of the economies of scale;
- centralized acquisition of common training would tend towards standardization of attitudes, equipment and procedures while retaining other methods of acquisition to meet unique requirements; and
- standardization, in turn, would facilitate such matters as interface among different users, bulk purchases and government planning.

6. Planning activities

The nature and rate of progress towards functional integration of telecommunications services in the government, within the overall context of office automation, is orchestrated through an evolutionary planning process. This section identifies the

participating bodies, their objectives and the mechanisms required in the planning process and provides a summary report on government telecommunications plans.

6.1 Departments and agencies

6.1.1 *Planning objective*

Departments and agencies are required to plan for efficient telecommunications services to support their programs.

6.1.2 *Mechanism*

Departments provide a telecommunications report and plan to Treasury Board on an annual basis. This document contains information on departmental plans to satisfy their future requirements and for resources to support approved five-year programs and long-range plans (beyond five years). This report, more fully explained in D.1, consists of two sections: one dealing with electronic data processing, the other telecommunications. A summary of the information received on telecommunications planning is presented below.

6.1.3 *Summary report*

> "It is becoming more and more difficult for the Telecommunications Managers to predict the services that will be required to meet the demands with the 'Information Society' of today. The manager's job has become indeed a challenge and it appears that the present trends will continue for a number of years . . . ."

This concern, expressed by one department, was echoed in the reports of several others. Voice telecommunications expertise alone, it was noted, will not be sufficient to manage the complex new systems appearing. Broader management training requirements are indicated.

Of the 58 departments that submitted ITSPs, one-third reported planning activity in varying detail, one-third submitted a modest amount of narrative and the rest submitted tables only.

Increased awareness of the need for planning and organization for office automation was reflected in the content. Where planning is reported, a phased approach is being taken. In some cases it has started with organization; in others, systems planning. As an example of both, a case study in information management planning (the RCMP's Master Plan) has been reproduced in Appendix II.

Actual organizational activity was reported by 11 departments and agencies; three others indicate no perceived need for change. Long-range systems planning was reported by 13 respondents, six of whom are also addressing the organizational issue. It must be noted, however, that matters relating to office automation were reported in the EDP section of the ITSP, which was not included in this analysis.

Voice service dominated the scene in 1984. At the time of reporting, most departments were in the process of being cutover to the new Enhanced Exchange Wide Dial (EEWD) digital centrex service provided through GTA in the National Capital Region. While it was too early for evaluations, the system was anticipated to be a potential source of savings and improved efficiency. Training sessions delivered by GTA were well attended and received.

Continued growth in voice services is indicated. Heaviest users are departments and agencies providing service to the public. For those organizations the telephone accounts for as much as 95 per cent of initial contacts.

Word processors are still in popular demand. Released from the bondage of incompatibility by enhanced telecommunications services, communication can now take place between a) word processors manufactured by different companies, b) word processors and electronic memory typewriters, and c) word processors and computers. These capabilities are being tested by the government as follows: GTA offers a service based on a); the Canadian Transport Commission is carrying out a pilot on b); and c) is being evaluated by the National Energy Board and the Canadian Transport Commission.

Widespread replacement of out-of-date **teleprinters** and **facsimile** equipment bear witness to the importance of messaging and image transfer in carrying out government programs. Benefits from the modern equipment are expected in terms of security, standardization and economy.

The National Research Council (NRC) is testing the displayphone, data terminals and word processors as **electronic messaging** devices, while others are trying Envoy 100 and Electronic Office Systems (EOS).

While no savings measurement of **teleconferencing** has been carried out in the government, four departments reported that it is an effective and relatively inexpensive substitute for travel.

Plans indicated continuing and increasing acquisition of **personal computers**, but detailed intentions were reported in the EDP section, which is not included here.

6.2 Government Telecommunications Agency

6.2.1 *Planning objective*

The primary objective of GTA planning activities is to optimize the government telecommunications systems and services in terms of their broad applicability and to minimize their costs through economies of scale and through exploitation of technological developments. The key attributes of the approach are cost-beneficial shared services and bulk procurements on behalf of departments and agencies. The GTA plans are shared by the common requirements of departments and government policy.

6.2.2 *Mechanism*

The most comprehensive report on government telecommunications planning activities is contained in the Government Telecommunications Planning Document. This document describes the principal services that GTA currently offers and those planned for upcoming years. It provides also a brief background of the technological and regulatory environment within which the evolution of government telecommunications is taking place. As an aid to departments in the budgeting of their telecommunications services, the Planning Document summarizes the current year rates for the GTA services.

6.2.3 *Summary report*

Current GTA plans for development of shared services fall into three major areas: basic telecommunications services, enhanced telecommunications services and consultant services.

The shared and customized voice services will continue to be major service portfolios of the Agency, and it is these services that will address the broad telecommunications requirements of the government. Improvements in the local network access features and in the inter-city services will be introduced as part of the modernization plan for the government consolidations and inter-city network.

New shared and customized data communications services, based on circuit-switching and packet-switching technologies, are being evaluated for the purpose of providing users with modern, low-cost data transmission capabilities. The circuit switched services will be supported on the digital switches that either have been already installed or are being installed in government consolidations; the packet-switched services will be provided by a new shared data network currently being planned.

GTA plans to introduce a new range of specialized services using a mix of terrestrial and satellite facilities. These services will be designed for applications where the use of satellite technology is the most cost-effective means of meeting the special needs of departments.

The trend towards enhanced telecommunications services for supporting interactive office communications requirements is being addressed by GTA through the development of a number of text and personal messaging services that have been introduced in the past year. GTA is planning to extend and consolidate these initial service offerings into a group of services based on the concept of integrated office services which will meet the future information-handling needs of the government offices. This will be done in conjunction with the development of commercial offerings stemming from the series of OCS pilot projects sponsored by DOC. The first planned offering, based on the OCS trial being conducted in Revenue Canada - Customs & Excise, will include such features as electronic and voice messaging, text communications, word processing, electronic filing, electronic cabinet, spreadsheets and access to various data bases.

The government services will be supported on a network infrastructure called the Government Integrated Services Network (GISN), which will be compatible with the Integrated Services Digital Network (ISDN) currently evolving from the existing public telephone network. Indeed, modernization of the consolidations includes replacement of analog switches by programmable digital switches, which will be an inherent part of the GISN. Digital terrestrial and satellite facilities will be integrated to form a single unified digital network on which government services will be supported.

GTA is currently studying the satellite path of transmission to establish the cost/benefit criteria for certain applications requirements. One approach is based on Time Division Multiple Access (TDMA) technology, and the other on Single Channel Per Carrier (SCPC) technology. The TDMA system is suited particularly to high-density traffic environments such as those found between large urban centres. SCPC systems have applications where light cross-section routes occur, such as those involving communications to remote locations. GTA is planning to develop these approaches to carry some of the government inter-city traffic currently carried on terrestrial facilities and to support a range of voice and data services that can be more cost-effectively provided by satellite.

The preceding outline of the GTA planning activities provides an insight into the manner in which evolution of telecommunications services and facilities is participating in the technological convergence process. The principles of the GTA approach to the planning process have not changed.

GTA has been responding to the demand by departments and agencies for state-of-the-art telecommunications and following the principles of effectiveness and efficiency, as directed by the government, in meeting those demands. The result is the emergence of an integrated telecommunications system serving the data and voice needs generally associated with the automated office environment. Special intervention in this process is mainly required to ensure that the natural technological evolution is co-ordinated with human resource and organizational development considerations.

6.3 Telecommunications Advisory Committee (TAC)

6.3.1 *Planning objective*

The TAC was established in 1977 to advise and assist DOC in the long-range planning and co-ordination of the use of telecommunications on a government-wide basis.

6.3.2 *Mechanism*

The work of TAC is carried out primarily by working groups selected and assigned specific objectives by the Committee.

6.3.3 *Summary report*

Throughout 1983/84 the Committee played an important role in ensuring a co-ordinated approach to the implementation of EEWD service in the National Capital Region.

In addition, proposed administrative practices on consolidated services were endorsed by TAC and supported in principle by Treasury Board. Pending formal approval, they were issued for insertion in the TMM.

The Working Group on Telecommunications Planning initiated a study of possible alternatives to the present procedure for producing the Annual Review. This resulted in a thorough examination of the overall planning process and a new planning instrument from GTA, entitled Government Telecommunications Planning Document. A better system for the exchange of planning information between GTA and departments evolved as a major objective of the Working Group.

Other issues under consideration by the Working Group were appropriate administrative measures for survivability, potential security problems presented by new Private Automatic Branch Exchange (PABX) remote control features, a recommendation for PO5 grade of service, maximum discount opportunities respecting EEWD rates, performance standards for in-house wiring, and GTA plans.

The Working Group on Telecommunications Definition and Expenditure Coding was reactivated to discuss the matter of deficiencies in the definition of economic objects for telecommunications and to bring about the necessary improvements. Proposed economic objects and definitions for informatics expenditures were developed and a definition of electronic office equipment was addressed. Appropriate recommendations, subsequently submitted to the Office of the Comptroller General, resulted in the issuance of new economic object codes effective April 1, 1984.

7. Concluding observations

The preceding pages have addressed concerns related to convergence; government objectives and priorities; legislative, regulatory, technological, industrial and socio-economic trends; research and development; administrative practices and planning activities. This final section is intended to sketch the total picture and to capture from it a sense of direction to assist departments in their planning.

Convergence, which will continue to dominate technological developments in the medium term, will provide the tools to increase the quality of work produced and the efficiency of producing it. While achievements to date have been limited to specialized functions such as word processing, electronic mail and management information systems, the extended functions available through a common technological base will provide instantaneous resources for reference and decision-making.

One manifestation of the beginning of the EDP/Telecommunications convergence (Section C), was channelling voice and data through a PBX - a significant development in the evolution of telecommunications, but far from the final word in integrated office systems. Data processing is a well established entity; even word/text processing - a relative newcomer to the scene - has reached a high level of sophistication; and progress on image/graphics processing is commanding increased attention. What remains to make office communications systems come of age is voice processing. This technology, in its advanced stages, will provide an important breakthrough for the office information worker in the nineties.

The government environment provides an ideal test bed for developing emerging technologies. Fibre optics, local area networks, digital termination systems, microwave distribution systems and new generation satellite systems offer opportunities for service innovation as well as reduced communication costs and increased user control. While regulatory decisions will play a large part in the development of these technologies, they, together with software and content development, represent potential growth opportunities for Canadian industry.

In line with industrial and carrier progress, new government shared services are evolving. Local network access features and inter-city services will continue to be improved in the short term, paving the way for a common technological base, the Government Integrated Services Network. Other network developments will provide service by satellite to high-density traffic environments as well as light-traffic, remote locations. Shared data communications services will be supported by both circuit- and packet-switched facilities.

An examination of the government's traditional modes of communication reveals that the telephone is used for as much as 95 per cent of the public's access to government. It is also estimated that 80-90 per cent of business exchanges (including the government's) is still conducted through voice transactions. These numbers leave little doubt as to the importance of voice systems to the affairs of the government and elicit small wonder why most forecasters are willing to wager that voice requirements will continue to dominate in the years to come.

Assessing the status of telecommunications in the mid-eighties, it would appear that the technologies that will be vehicles for meeting departmental objectives have been identified. From now on the industrial and research sectors will be concerned with further development and refinement of these technologies and the public sector must seek to achieve the greatest benefits from them.

Linking the deployment of technology to corporate strategies has always been a fundamental challenge facing telecommunications managers. Now, with the complexities of convergence, that has become an increasingly tall order. Several government departments and agencies are already achieving this goal and in those instances convergence is helping to unify and strengthen the organization. Perhaps, in the final analysis, it will be through the synergistic nature of the technologies that the greatest advantages will be achieved within the government.

F. APPENDIXES

I A Study on Employment Effects

II A Case Study in Planning

III A Case Study in the Electronic Office

IV Reading Guide

V Glossary of Abbreviations

APPENDIX I

A study on employment effects

The following paper was presented by Dr. T Grusec at the International Seminar on Technology, Innovation and Social Change, sponsored by Carleton University and the University of Edinburgh and held in Ottawa on October 26, 1984.

Dr. Grusec and the sponsors of the seminar have graciously permitted reproduction of this informative exposition to more clearly identify the impact of information technology on the workforce.

Employment Effects of Information Technology

T. Grusec, Ph.D., Associate Director
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Government of Canada

My purpose is to examine expectations about employment effects of the applications of information technology. After briefly looking at the nature of the technology, I will outline and discuss the two prevalent and opposite scenarios about employment effects expected in the office.

I will then turn to a general picture of technology effects on employment, since I do not believe there is anything unique about the office situation or about this technology. The historical record should tell us all we need to know about productivity and employment relationships generally.

However, there is one element about this technology which some people think does make it different in its effects and that is the rate or speed of change with which the technology will come into place. And so, I will end the presentation by commenting on rate of change on the basis of my experiences, including those in my present work of examining field trials of office technology in government departments.

The Nature of the Technology

We are dealing with a class of technologies which is used to capture, store, process, manipulate, transform, transmit and display information. The element behind these events which unites them is digital coding in electronic form. The hardware components of this information technology include keyboards, keypads, scanners, sensors, computers, optical and magnetic disks, tapes, memory devices, coaxial and optical fibres, networks, satellites, cathode ray tubes, liquid crystal displays, high-speed printers, and smart copiers. This technology is not confined to the office. In our daily lives, we are increasingly faced with various configurations of these components in point-of-sale terminals, automatic teller machines, personal computers and workstations, the newer telephones, word processing equipment and new industrial machinery. Less visible but no less pervasive is incorporation of information technology into older machines and devices such as automobiles, stoves, furnaces, power tools and entertainment equipment.

This technology has led to new taxonomies of events. We now speak of "information components" or "information processing" aspects or perspectives within diverse areas such as mechanical engineering, biology and psychology. In the world of work, the technology is expected to unite and integrate events which were previously

separate sets of activities such as information search and retrieval, document and graphics creation, data processing, computation, telephony, meeting and conferencing, filing, mailing, messaging, and scheduling. In the near future, the complete execution of various combinations of these events may be done from a single device, a desk-top workstation with a keyboard and/or other input devices and with video displays and other outputs. Thus, information technology promises or threatens to transform office work as we know it.

While I will continue to use the term "technology" in the singular, I should state again that we are dealing with a class of technologies, the elements of which can be put together in a very large number of unique configurations. Thus, this technology can be considered to be a loosely-bundled set of elements, rather than a single entity.

The Two Scenarios

There is a literature reflecting the self-interests of the major stakeholders which presents scenarios of hope and fear about information technology in the office. For example, unions picture workers chained to video display terminals, goaded and monitored into furious productivity, while simultaneously having their health impaired by radiation and losing their jobs through structural unemployment. System vendors and their allies, on the other hand, talk of benign productivity gains, intellectual enlightenment and new horizons for the fulfillment of creative potential. Some studies suggest that both directions of effects may occur, one for managers and professionals, the other for task-oriented support personnel.

In the pessimistic scenario, the following logic suggests a "villainous" role for information technology. As the new information technology tools in the form of multi-function workstations come to be used increasingly, they are bound to minimize the need for support activities and jobs. As an example, tasks such as document filing and distribution can become integrated more closely with document origination and be accomplished with a few extra keystrokes by the manager or professional or by his or her word processing operator rather than by a body of specialized support staff. Similar considerations hold for many office tasks. This efficiency effect, which displaces support work and adds it to the jobs of those higher in the organization will probably not increase the work load higher up since the added tasks are only trivial additions of time and effort because of the simplified nature of the tasks in their electronic transformation.

This kind of task displacement is one of the general patterns of effect which is frequently seen to result from new technologies. As an example, operating the computerized switching equipment to connect long distance telephone calls is now accomplished by numerical codes dialed by the call initiator and is far less frequently accomplished by a telephone operator. The net effect has been to drastically shrink the number of telephone operators over the last ten years at the cost of a trivial addition to the task of telephone users who now have a few additional numbers to dial. In effect, a massive decentralization has occurred with each telephone user becoming his or her own telephone operator.

Looking at managerial and professional work in this pessimistic scenario, information technology does not appear to suggest employment effects as clearly as it does for support work. There may be efficiency gains here too, but such gains will more likely be used to expand work rather than shrinking the numbers of persons. This is because, to a large degree, managerial and professional work is very fluid and tends to be self-generating. I know of no manager or professional who runs out of things to do. On the other hand, of course, an executive decision to use any expected efficiency gains to cut such staff can be made. But this is a decision to resist expanding work and is not an implicit consequence of the technology perused as was the case for support work.

In the view just presented, we are to expect major unemployment effects in support work, with perhaps lesser unemployment as we move higher in the organization.

Looking at the same kind of picture from the optimistic scenario, it would be suggested that rather than unemployment, a transformation in the kind of work done would result. Instead of eliminating or minimizing support work, new work would be created because the nature of the technology would encourage this. For example, because of ease of access to information sources and to computing power which the new technology can facilitate, a given office might find itself doing some of the things that other departments of the organization, or outside agencies, once did for that office. This might include things like library services, database management and document printing. Information technology might easily enable such vertical integration and decentralization of functions and services. The effect, then, would be that support staff could be retrained to do these new jobs. Ergo, not only would there be no unemployment but there would be job enrichment and upgrading.

Scenario Problems

The primary problem with both the optimistic and pessimistic scenarios is that they ignore the multiple consequences in the larger context within which any changes, such as the implementation of information technology in the office, occur. In a recent paper, Stephen Peitchinis outlines six levels of employment effects that have to be taken into account when determining employment effects of any technology. The first level is the production of the technology itself. This includes all the employment that is involved in the design, testing, financing and marketing of the technology as well as the labour in the related materials and services suppliers who become directly involved with the technology producers. The second level is the application of the technology. In our case this is in the office, and various employment effects, including upgrading, structural unemployment and new employment may occur in this setting as a result of the technology. It is important to note that the popular scenarios we mentioned address only this second level. The third level is employment in the infrastructure necessary to manage the technology and this includes technicians, and professional, administrative, sales, finance and planning personnel. The fourth level is at the input and output ends of our office or organization and involves other organizations and processes external to that office or organization but directly related to its product, whatever that might be. This might include suppliers of materials, services and information at the input side, and the processes involved at the output end which may include dissemination by transportation and communications. The fifth level is employment in the general infrastructure associated with services to organizations in general and this might include financial, real estate, municipal and other public services. The sixth level is employment generated by the expenditure of incomes derived from all the previous levels. In today's global economy, these various levels would extend outward to embrace international trade interrelationships.

Especially with a technology as pervasive as information technology promises to be, one must look at the total picture in order to understand net employment effects. A very distorted view will emerge if you look only at the second level, the applications of the technology, as is true of the popular scenarios.

Zavis Zeman, in a report issued late in 1979 which has not lost its currency, also critically examined the popular scenarios and the foundations for them. He too identified many complicating variables that are overlooked. In addition to the interactions among the various sectors and levels of the economy mentioned above, these include: highly variable technology diffusion rates due to differential availability of capital, and due to the large time gaps between different companies and different sectors in adopting a technology; unexpected development of new industries;

international technology transfers which might result in trade-offs such as job gains in one country at the cost of job losses in another; policy constraints such as minimum wage laws, inflation control mechanisms (e.g. interest rates), and government regulations which can affect the distribution of the benefits and of the costs of technology; growth in the work force, especially that which is due to women and to the baby boom.

In the light of these complexities, the polarization between optimists and pessimists in the world literature was seen by Zeman as essentially ideological and political, rather than being based on sufficient and consensual facts. Each side proceeded from different, debatable, and inadequate core assumptions. I quote Zeman:

> "On the key question of the net job balance effect for the whole economy there exists no consensus in the debates.
>
> "---- with the present state of knowledge and with so many factors at play, no one really knows what the net employment outcome of this new wave of technology will be - in Canada, and, for that matter, elsewhere."

One cannot disagree with Zeman that no one really knows. However, that should not prevent relevant speculation which tries to take the complexities of the real world into account. Peitchinis, in the paper I cited earlier, tried to do that. I will briefly touch on some of his points before presenting some speculations of my own about expected rates of technology change based on work I have done.

Productivity and Employment

The basic economic principle that Peitchinis stresses is that productivity changes alone do not produce employment changes. Changes in demand also have to be taken into account and this refers not only to changes in quantity but also in quality and in the nature and total mix of demands. One of the misconceptions underlying simplistic scenarios is that quantities of goods and services are somehow fixed. This has never been true historically. Instead the record clearly shows that demands are always changing. Furthermore, the long run history of technological impacts shows that labour intensity in the production of goods and services has always decreased, while, simultaneously, aggregate employment and living standards have increased.

Various mechanisms are evident in yielding the employment and living standard effects. As an example, we can look at agriculture. Here, there have been, in Canada, productivity increases of almost 100% per decade since 1940. But the volume of demand and output in agriculture has increased only 50% per decade. The result of the output increases being less than the productivity increases has meant a decrease in agricultural employment. However, there have been substantial increases in employment in activities functionally related to agriculture - for example, in farm equipment and machinery, fertilizers and chemicals, agricultural research, farm consultation, government and institutional departments and agencies, and in the many services related to all of these including financial, transportation, marketing and distribution services. Peitchinis suggests that in reality what has happened is not a decrease in agricultural employment but rather a major change in the industrial and occupational structure of employment related to agriculture.

But even if the net effect, taking into account the structural change, has been a decrease in agriculture-related employment, other sectors of the economy have expanded, to take up the surplus labour in shrinking sectors. This has been especially true of the service sector. Here, productivity increases have been consistently lower than demand increases, hence employment has increased at remarkable rates. Among the transformations within the service sector has been the decrease in domestic servants from 20% of the female labour force in 1931 to virtually zero by 1961, partly due to electromechanization of household work. Forecasters in the 1930's operating on limited assumptions similar to some of those underlying the simplistic views of information technology we examined would have predicted economic disaster for domestic servants but would probably not have been able to predict the more than 50-fold increase in secretaries and typists over the same 30 year period, which was due to a phenomenal demand growth.

From a historical perspective of changes in processes, structures, interrelationships, and so on, there is no reason whatever to expect that occupations 40 years from now will resemble those of the present. For example, banking and insurance employment and secretarial work may virtually disappear and new barely conceivable or entirely unpredictable employment might become prominent. Most of today's jobs have come into existence only within the last 40 years.

While the service sector has grown, and continues to grow remarkably, it may be asked how long this can continue since, historically, technology has always decreased labour intensity. It appears that in the primary industries and in manufacturing, employment has more or less stabilized. With an increasing labour force, this translates into a projection of continued gradual decline in proportions of the labour force in the primary and

goods-producing sectors. Since this decline in these sectors is due to labour intensity decreases, would not a similar substitution of capital for labour in the services sector which is what information technology represents, eventually produce a similar decline? This question implies a "jobless growth" scenario.

In answer to this scenario, Peitchinis suggests a number of factors which will strongly favour continued expansion and growth in the service sector. These include services which are now provided minimally but which most of us would agree would raise our net social and economic well-being if they were to be expanded. Included here are care for the very young and for the very old, and aid to the poor at home and abroad. There are still other services which are primarily accessible to the wealthier segments of society but which are highly desired and could become accessible to increasing proportions of the population. Wealth creation by increased productivity due to information technology could be translated into expansion of services along these and other socially desirable directions.

Peitchinis reminds us that the current unemployment problem is due to aggregate negative output and productivity, i.e., to lack of economic growth, and is not due to productivity increases by technology. Looking at the 1965 to 1981 period, when vast increases in microelectronic technology use occurred, especially with computers, there was a simultaneous employment increase of 4 million persons in Canada, and half of this increase was in the service sector. This increase of 4 million is one-third of Canada's labour force. This increase occurred despite losses in certain job enterprises. During this same period, a real increase in incomes and standard of living also occurred. Thus, the growth producing productivity gains during this period were partly distributed in higher real salaries and wages.

But also, the productivity gains were distributed through another very important mechanism, namely a decrease in hours of work. The overall weekly work time was 43.75 hours in 1951 and this declined to 34.6 hours in 1981. This was large scale work-sharing which Peitchinis refers to as a sharing in growth by contrast to a sharing in misery which current job-sharing suggestions appear to be. More than half of the employment increase during this 1951-81 period was due to this decrease in hours worked. Part of this decrease was manifest as increases in the number of paid holidays, in vacation time, special leave time and other time off work.

This increasing leisure time suggests still further avenues of service sector expansion. People fill leisure time with intrinsically rewarding and satisfying activities such as high and low form of creative pursuits, entertainment, sports, self-improvement, social activities and travel. The list is endless.

Perhaps we are due for a large scale growth in the infra-structure required to support leisure-related activities. This could be added to the services, mentioned above, which are now available mostly to the wealthier segments of society. It is interesting to note, in this connection, that information technology applications, apart from work, are also occurring directly in leisure-related activities - for example, in home education, visual arts, music and games.

Peitchinis stresses repeatedly that our concern should be with economic growth itself rather than whether or not jobs functionally related to the growth areas are lost. As long as productivity increases lead to economic growth there should be no problems any greater than before of translating the growth into new jobs, higher incomes and leisure time increases.

I have been stressing new job creation since this appears to be our dominant mode of wealth distribution. In the much longer term, one might extrapolate increases in leisure time to a virtual zero need for any employment. Is not the whole point of technology application in work to minimize or eliminate all those things people do not want to do? We would then be left to do only, or mainly, those things that we do want to do, things that are truly, uniquely, exclusively human. These activities do not include most jobs people now do, including support work in offices.

Rate or Speed of Change

Finally let me turn to a consideration of the rate of change. This is a most important variable. Some observers maintain that it is the rapid rate of expected implementation which distinguishes information technology from all past technologies. If this is so, then even if sophisticated but optimistic scenarios such as Peitchinis presents turn out to be true in the long run, the short-term transition might produce employment strains and social discomfort. There can be serious gaps in time between displacement of a worker by technology and the generation of new employment in the event of very rapid implementation. Also, even if new jobs come into existence very fast, transfer of persons from an older into a newer kind of work can be slow and may involve individual and social stress.

Some of my colleagues will disagree with me, but I believe that rate of change due to information technology in the office may come to resemble the relatively slow agricultural to urban transition more closely than it will a rapid "third wave" revolution as pictured by Toffler and other futurists. First, information technology is more conceptually than actually in place and the

ongoing development work can be quite prolonged. For example, networking elements, which must rely heavily on not-yet agreed upon international standards, are among the crucial missing elements in the information technology integration of the presently diverse and separated work functions which comprise work in offices.

As a second consideration which affects rate of change I refer back to my description of information technology as a loosely bundled set of elements. This means that while certain generic functions will be common among many offices, the specific configuration of elements which is best suited for a given office may require considerable tailoring in view of the unique needs of each organization. **This makes "office automation" very different from data processing computer applications. The latter are highly generic and involve very little need to understand, in any depth, the unique features of an organization, its missions and the way its people work. The opposite is true of information technology in the office. Although various typologies of offices have been attempted, they are very crude and do very little to facilitate optimal implementation of information technology. Arriving at a detailed understanding of individual and organizational needs in information technology applications is a fine, unmastered art which, at its best, involves a team of experts including technologists and social scientists interacting with potential users. It is extremely difficult for users to determine what they will find truly useful in a set of technologies they have had little or no experience with, even with the help of experts. A good needs analysis in the office area is difficult and slow to achieve.**

The third consideration involves organizational and individual learning. This too can take a long time, even if the right technology configurations for a given setting were fully available and if needs were well understood. I am not talking about training, by which I mean only learning to push the right keys in the correct sequence to perform a desired set of ends. Rather, I am referring to **the transformation of work methods by individuals and by organizations which will be necessary before productivity benefits can be realized.** Indeed, there can be prolonged productivity drops, quite extended in time (months, even years), before final benefits come into place.

I would not care to make calendar time predictions, but I suspect that these three factors - **technology development, understanding of needs, and organizational and individual learning** - may slow the implementation process sufficiently to offset the potential disorderly transition which might otherwise occur.

(Emphasis added by editor.)

Summary

In summary, then, information technology promises to increase productivity in the office. This may create employment dislocations. But the aggregate effect of such dislocations, should be no different than in the past with other productivity-enhancing technologies. Provided that the economy grows and wealth is created, productivity increases should be translated into a combination of higher real salaries and wages and decreased work time. Rather than a "jobless growth" that some predict, there is no feasible limit to expansion in the service sector.

Some see a rapid rate of implementation of information technology as at least a short-term, serious threat to employment stability. Based on my experience, I think that the rate of change will be slower than expected and will not be destabilizing for three reasons: the technology is being developed more slowly than predicted; choosing the right technology mix for any office is a very slow process; once you have the right technology, organizations and individuals may take a very long learning time before the technology can be used effectively.

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APPENDIX II

A case study in planning

Acknowledgment

The authors of this Annual Review and Planning Framework for Telecommunications in the Government of Canada - 1984 wish to express their gratitude to RCMP Assistant Commissioner W.J. Wylie, Director, Telecommunications and EDP, and past chairman of the Telecommunications Advisory Committee, for his kind permission to present this most interesting case study to the telecommunications community.

Foreword

The Auditor General, in his report to the House of Commons for the fiscal year ended 31 March 1983, regarding Information Resources Management, recognizes that:

> "managing information resources is no different from managing other traditional resources such as money, people, supplies and material."

In the spirit of the Auditor General's statement we are pleased to introduce this case study of the Royal Canadian Mounted Police's Information Management Master Plan. The following text, re-printed from the Master Plan, reflects the spirit of the Auditor General's remarks.

RCMP INFORMATION MANAGEMENT MASTER PLAN

Purpose of the Master Plan

This Master Plan, when approved by the Senior Executive Committee, will provide the RCMP with a broad development framework to which existing and proposed applications can be related in support of the strategic direction defined in the Plan.

This Plan is assembled in consideration of:

(a) Assumptions - general assumptions are made concerning the Force's position and future;

(b) Environment - many environmental factors, internal and external, affect the strategy for future systems development.

As projects are identified, in support of strategic initiatives, they will be evaluated as to their contribution (efficiency or effectiveness), adequately costed and factored into the current Operational Plan for approval by the Senior Executive.

The Master Plan will be updated annually to reflect changing circumstances as part of the normal planning process of the Force. In subsequent years this Plan will embody the EDP Strategic Plan and the Telecommunications Long-Range Plan as a composite document addressing all matters pertaining to information management.

Assumptions

As a basis for this Master Plan the following assumptions are made for the planning period. It is assumed that:

(a) The RCMP will continue to enforce federal, provincial and municipal statutes and legislation and maintain its role in the international justice community (with the exception of the current Security Service role);

(b) The RCMP will continue to perform a Canadian Police Service role (including providing the lead role for national information systems, and research into science and technology to meet the needs of the Canadian police community);

(c) The proposed information management planning process will eventually be integrated into Planning and Evaluation Branch's Force-wide planning process.

Environmental Factors

External Issues

The following issues are external to, but have a direct bearing upon, the subject of this Plan.

(a) The overriding factor that will affect all functions of the Force into the forseeable future is the federal government's emphasis on fiscal restraint.

(b) The legislative and legal requirements imposed by the Access to Information and Privacy Acts demand accurate knowledge of information held and efficient means of retrieval.

(c) Treasury Board policy for improved expenditure management and the attention given to the functions dedicated to information management will require amalgamated systems planning.

(d) The Office of the Comptroller General IMPAC plan includes a requirement for long-range systems planning.

(e) The Auditor General is calling for improved planning, increased accountability at all levels and the development of standards of management performance.

(f) Increasing health and labour regulations will introduce additional factors to be considered in the application of new technology.

(g) The initiatives of individual federal agencies which will affect government policies, i.e. Office Communications Systems (OCS) program of the Department of Communications and Justice Information Committee influence on justice information systems.

(h) The existence of a widespread public knowledge of the need for automation in numerous areas of work and leisure and the desire to apply new technology in the private sector and educational institutions will not allow a government department to ignore the need to manage information as a vital resource.

(i) The information revolution, driven by technological advances and their widespread application, will continue during this planning period as a result of industry trends (e.g. office automation, home computing, information utilities, decision support systems, electronic mail). Price/performance improvements in technology will continue to accelerate, extending the capabilities of automated information EDP systems further into the user community.

(j) Information systems design direction will move towards:

(i) decentralized information systems where practical in order to avoid increasing operating complexity;
(ii) increased emphasis on availability, confidentiality, integrity and interactive accessibility of EDP systems;
(iii) increasing tendency to integrate police and justice information systems at the federal and provincial levels.

(k) The provision of information services within the RCMP must reflect the spirit of the Official Languages policy.

Internal Issues

(a) The priorities set out in the Commissioner's Directional Planning Statement impacts the strategic direction of information systems development within the RCMP.

(b) The increasing awareness of RCMP managers, at all levels, of the value of automation plus their growing knowledge of information processing technology is resulting in increased demand for automated systems.

(c) Increasing operating complexity of Force automated information systems will demand a move towards decentralization bringing new problems of management and control.

(d) Current job classification standards and practices place restrictions on the mandate of the manager and fail to establish appropriate accountability.

(e) The Force's resident Information and Communication Management (ICM) expertise and the state of our information management provides lead time to prepare the internal environment to minimize the negative and maximize the positive impact of automation upon the human resources.

(f) The degree of computer literacy within the Force provides an environment conducive to automation.

Problems

Summary of Policy Centre Concerns

Previous results of the Information and Communication Management Project (ICM) include the identification of the following weaknesses and deficiencies in Force information systems management:

(a) a lack of overall planning and co-ordination;
(b) information is not managed as a basic resource;
(c) there is a lack of clear accountability for value;

(d) information planning is not pro-active;
(e) there is a lack of knowledge as to what information assets are available which highlights the need for a central index;
(f) many systems are not compatible;
(g) there is a need for improved training;
(h) old systems are often no longer responsive to need.

In addition to identifying problems and solutions it is estimated the primary activity of the Force is information processing including as high as 85% of available resources. These concerns have been directly related to the following major problems.

Accountability

Present practices and procedures make it difficult to identify the true value/cost of information systems development, operation and maintenance thereby contributing to a lack of control. The continuance of this situation is caused in part by:

(a) the lack of a planning element for Information Management;
(b) the absence of expertise in the application of cost benefit analysis to the development and use of information systems;
(c) the absence of the necessary managerial and systems standards of performance;
(d) the attitude by some managers that information is "free";
(e) the failure of some managers to recognize the regulatory and legal obligations that apply to "their" systems;
(f) the lack of one coordinated system of project management for all information systems; and
(g) the need to provide management with the necessary training relevant to determining information needs and the use of management information systems.

Planning

Planning for information systems development has suffered from the lack of coordination - "R" Directorate plans for non-automated systems, EDP plans for automated systems and Telecommunications plans for communication systems. However, these plans are not necessarily related to common targets or strategies. The lack of strategic direction which has been properly communicated has resulted in the development of uncoordinated systems which at times seem to be at odds with one another. This fragmented approach has sometimes placed these responsibility components in competition with each other and results in a potential waste of scarce developmental and operations resources.

The chart shown as Figure A-1 indicates very clearly where we have directed our information systems development resources over the years. The chart shows the primary concern has been with operational systems - and rightly so! What it does not show is: have all these systems been developed in response to the fundamental information needs of the Force?

The absence of a plan makes it impossible to determine whether or not systems have been developed to meet the broader needs of the organization.

Non-Automated Records

Recent years have seen an unprecedented rate of growth in the established strength of the RCMP. In the same period legislation, regulations and changing conditions have resulted in an explosive increase in the variety, volume and complexity of information with a corresponding demand on our information services. Our labour intensive non-automated records keeping practices are no longer responsive to today's information environment. Simply adding more resources, if that were possible, would not solve the problem. New methods must be found to alleviate the situation before our non-automated records become totally unmanageable.

Opportunities

(a) Planning for information systems as required for any other valuable resource can provide the essential means to manage the 35% of the RCMP budget which is directly related to information processing.

(b) Planning for information systems can make a major positive contribution to the primary mission of the Force.

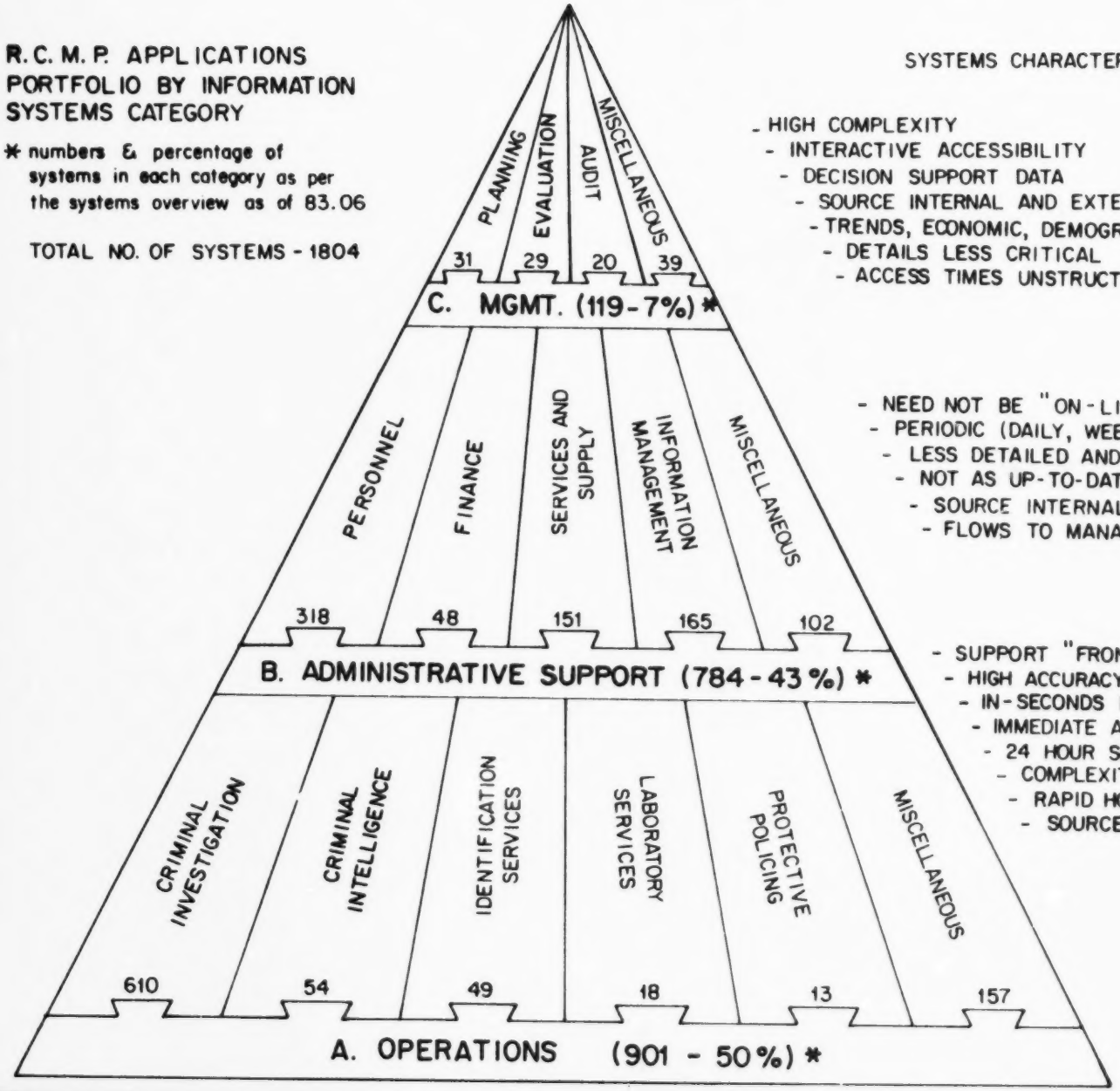
(c) The documentation and ledgering of all information systems can provide a major management tool to establish accountability for value, cost, legal obligations and audit at all levels.

(d) Current technological offerings can permit automation of many labour intensive information processes in a very cost effective manner.

(e) Automation of selected information processes can provide a higher quality of timely operational, administrative and management information to support law enforcement functions.

(f) The recognition by major central agencies of the Force's leadership in information management can be exploited to greater advantage in securing sponsorship for initiatives which directly contribute to the objectives of this Plan.

FIGURE A-1


R.C.M.P. APPLICATIONS PORTFOLIO BY INFORMATION SYSTEMS CATEGORY
* numbers & percentage of systems in each category as per the systems overview as of 83.06
TOTAL NO. OF SYSTEMS - 1804
SYSTEMS CHARACTERISTICS BY CATEGORY
- HIGH COMPLEXITY
- INTERACTIVE ACCESSIBILITY
- DECISION SUPPORT DATA
- SOURCE INTERNAL AND EXTERNAL
- TRENDS, ECONOMIC, DEMOGRAPHIC
- DETAILS LESS CRITICAL
- ACCESS TIMES UNSTRUCTURED
PLANNING
EVALUATION
AUDIT
MISCELLANEOUS
31
29
20
39
C. MGMT. (119 - 7%) *
- NEED NOT BE "ON-LINE"
- PERIODIC (DAILY, WEEKLY, ETC.)
- LESS DETAILED AND COMPLEX
- NOT AS UP-TO-DATE AS OPERATIONAL
- SOURCE INTERNAL (MOSTLY OPERATIONAL)
- FLOWS TO MANAGEMENT LEVEL
PERSONNEL
FINANCE
SERVICES AND SUPPLY
INFORMATION MANAGEMENT
MISCELLANEOUS
318
48
151
165
102
B. ADMINISTRATIVE SUPPORT (784 - 43%) *
- SUPPORT "FRONT-LINE" PERSONNEL
- HIGH ACCURACY AND AVAILABILITY NEED
- IN-SECONDS RESPONSE
- IMMEDIATE ACCESS AND UPDATING
- 24 HOUR SERVICE
- COMPLEXITY OF SYSTEM HIGH
- RAPID HORIZONTAL LINKING OF DATA
- SOURCE EXTERNAL
CRIMINAL INVESTIGATION
CRIMINAL INTELLIGENCE
IDENTIFICATION SERVICES
LABORATORY SERVICES
PROTECTIVE POLICING
MISCELLANEOUS
610
54
49
18
13
157
A. OPERATIONS (901 - 50%) *

(g) The existence of and experience with national communications networks can permit the Force to capitalize readily on innovations such as conferencing and electronic mail which are particularly suited to our decentralized environment.

(h) The national, provincial and municipal roles of the RCMP provides an opportunity to influence the standardization of police information systems in Canada to the advantage of the total police community.

(i) Technological advances which allow for economical proto-typing and simulation will permit the Force to conduct systems analysis with regards to systems need in a more cost effective manner, i.e. the information required to decide need, feasibility, make, buy, eliminate can often be obtained in a fraction of the time required under more traditional methods.

(j) Automation will allow the Force to increase productivity by freeing the users from their many labour intensive information work processes.

(k) Information management will allow the Force to accurately allocate systems cost to the appropriate responsibility centres.

Information Management

Strategic Planning Framework

The following chart (Figure A-2) represents the recommended direction information management and information systems development should follow over the next five years. The chart illustrates the cognitive base from which the Objectives were formulated and defines the strategic initiatives in support of the Objectives. Where a strategic initiative is not of a continuing nature tentative target dates have been assigned.

Objective I - Information Management

To establish and maintain a comprehensive program for management of the information resources required to support the primary activities of the RCMP by:

1. organizing all units engaged in the administration, development and operation of information systems and services, (i.e. electronic data processing, telecommunications, and records management) under a single responsibility centre with integrated policy and planning functions; (Target: FY 83/84)

FIGURE A-2

FACTORS

Internal:
- Commissioner's Directional Statement
- Increasing awareness of managers
- Increasing operating complexity

External:
- fiscal restraint
- legal and regulatory
- Treasury Board
- Comptroller General
- Auditor General
- Official Languages
- health and labour regulations
- Federal agency initiatives
- public and industry pressures

PROBLEMS

- Accountability
- Planning
- Non-automated records

OPPORTUNITIES

- labour intensive functions/ productivity increases
- national communications networks and computer literacy
- resident expertise throughout organization
- national/provincial/municipal role and reputation
- improved information quality and delivery

OBJECTIVE I

INFORMATION MANAGEMENT

To establish and maintain a comprehensive program for management of the information resources required to support the primary activities of the RCMP by:

STRATEGIC INITIATIVES

1. organizing all units engaged in the administration, development, and operation of information systems and services (i.e. electronic data processing, telecommunications, and records management) under a single responsibility centre with integrated policy and planning functions; (Target: FY 83/84)

2. creating a data administration function to provide centralized management of corporate data as a primary resource of the Force; (Target: FY 84/85

3. establishing an integrated information management policy for the RCMP through amalgamation of separate policies presently in existence for electronic data processing, telecommunications, and records management and the creation of new policy to provide accountability for value and cost of information systems; (Target: FY 84/85)

4. establishing integrated planning for future information systems and services required by the Force; (Target: FY 84/85)

5. recommending programs for training and development of human resources to cope with the changes occuring in traditional information-related disciplines. (Target: FY 85/86)

OBJECTIVE II

INFORMATION SYSTEMS AND SERVICES

To contribute to the efficiency and effectiveness of RCMP programs through delivery of timely, accurate, and relevant information systems and services to satisfy legislative, operational, and administrative requirements by:

STRATEGIC INITIATIVES

1. developing an automated master index (AMI) of all RCMP records in compliance with the Access to Information and Privacy Acts and Treasury Board policy; (Target: FY 87/88)

2. implementing an automated occurrence reporting system (Police Information Reporting System -PIRS) in all operational Divisions; (Target: FY 84/85 for access to Federal units in all Divisions with phased implementation to other areas as priorities dictate.)

3. developing an automated command and control system for RCMP communications centres (Computerized Integrated Information Dispatch System - CIIDS) with direct input to the occurrence reporting system; (Target: FY 85/86 for development. Implementation to be phased over future years as priorities dictate until all communications centres are served.)

4. implementing a management information system (Planning, Accounting, and Reporting For Operational Use of Resources - PAR FOUR) to provide improved accountability by relating resource plans and expenditures to results; (Target: FY 84/85)

5. implementing an improved personnel management information system (PARADE III) by providing extensions to the present system to deal with complaint procedures, recruit assessment, performance evaluating, Public Service personnel management, medical profiles, officer candidate data, and insurance benefits; (Target: FY 84/85)

6. developing a standard automated office support system (RCMP Office Support System - ROSS) for creation, storage, retrieval, and transmission of documents and correspondence by electronic means; (Target: FY 84/85 for development. Implementation to be phased over future years to all Divisions.)

7. implementing an integrated RCMP data communications network, replacing the present CPIC and Data Centre networks, to serve the requirements of all information systems of the Force. (Target: FY 85/86 except for CPIC communications which will be migrated to the new network on a phased basis from FY 85/86 to FY 87/88.)

RCMP INFORMATION MANAGEMENT STRATEGIC PLANNING FRAMEWORK

11/83

2. providing centralized management of corporate data as a primary resource of the Force; (Target: FY 84/85)

3. establishing an integrated information management policy for the RCMP through amalgamation of separate policies presently in existence for electronic data processing, telecommunications and records management and the creation of new policy to provide accountability for value and cost of information systems; (Target: FY 84/85)

4. establishing integrated planning for future information systems and services required by the Force; (Target: FY 84/85)

5. recommending programs for training and development of human resources to cope with the changes occurring in traditional information-related disciplines. (Target: FY 85/86)

Objective II - Information Systems and Services

To contribute to the efficiency and effectiveness of RCMP programs through delivery of timely, accurate and relevant information systems and services to satisfy legislative, operational and administrative requirements by:

1. developing an automated master index (AMI) of all RCMP data banks in compliance with the Access to Information and Privacy Acts and Treasury Board policy; (Target: FY 87/88)

2. developing an automated occurrence reporting system (Police Information Reporting System - PIRS) in all operational Divisions exclusive of the Security Service, (Target: FY 84/85) for access to Federal units in all Divisions as defined in the authority of the existing contracts with phased implementation to other areas as priorities dictate;

3. developing an automated command and control system for RCMP communications centres (Computerized Integrated Information Dispatch System - CIIDS) with direct input to the occurrence reporting system; (Target: FY 85/86 for development. Implementation to be phased over future years as priorities dictate until all communications centres are served)

4. implementing a management information system (Planning, Accounting and Reporting For Operational Use of Resources - PAR FOUR) to provide improved accountability by relating resource plans and expenditures to results; (Target: FY 84/85)

5. implementing an improved personnel management information system (PARADE III) by providing extensions to the present system to deal with complaint procedures, recruit assessment, performance evaluations, Public Service personnel management, medical profiles, officer candidate data and insurance benefits; (Target: FY 84/85)

6. developing a standard automated office support system (RCMP Office Support System - ROSS) for creation, storage, retrieval and transmission of documents and correspondence by electronic means; (Target: FY 84/85 for development. Implementation to be phased over future years to all Divisions)

7. implementing an integrated RCMP data communications network, replacing the present Canadian Police Information Centre (CPIC) and Data Centre networks, to serve the requirements of all information systems of the Force. (Target: FY 85/86 except for CPIC communications which will be migrated to the new network on a phased basis from FY 85/86 to FY 87/88.)

Information Management Organization

Interim organization as approved by the Senior Executive Committee, December 1982, see Figure A-3.

Initial organization as proposed by "A" Directorate, November 1983, see Figure A-4.

Mission Statements

Directorate of Information Management Mission Statement

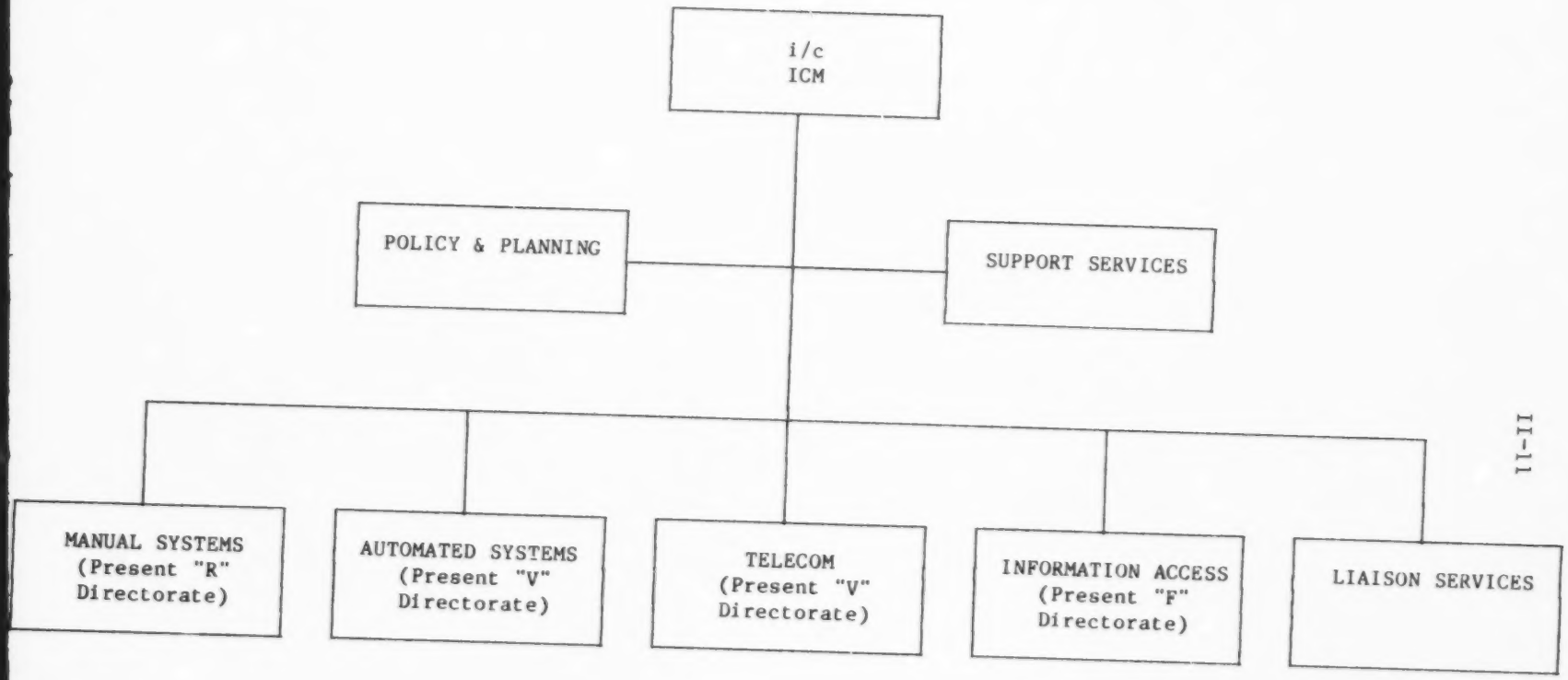
As the departmental policy centre, the Directorate shall develop and maintain a comprehensive program of information management which meets the needs of the Force and is consistent with regulatory and legislative requirements and ensures the most economical, efficient and effective use of relevant resources.

OBJECTIVE

(a) Ensure a continuing comprehensive, planned and co-ordinated approach to all information systems development and provide systems operational assistance and consulting.

(b) Develop and maintain policy, procedures, and standards to ensure adherence to accepted information management practices and related human resource development.

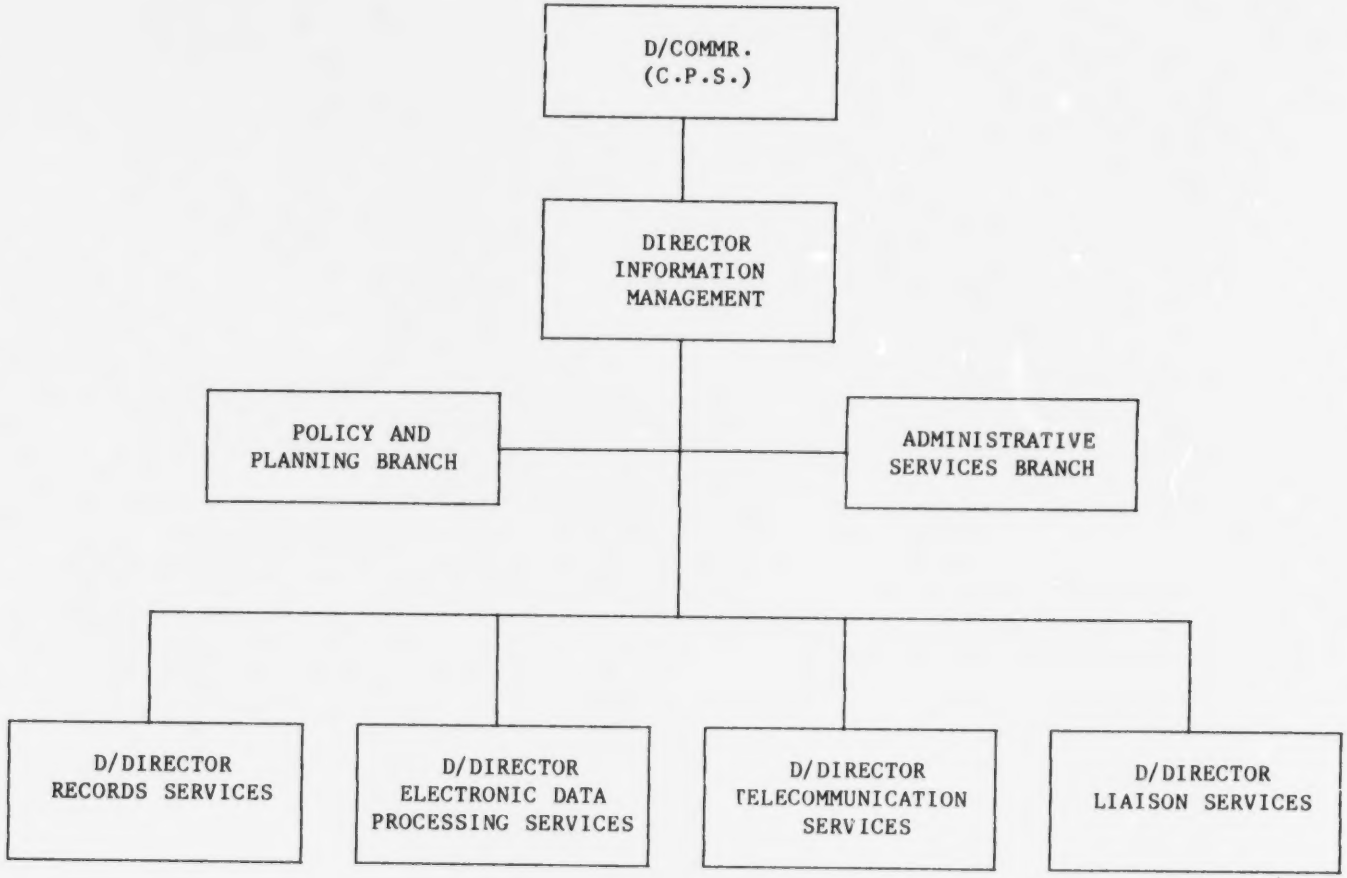
FIGURE A-3



INTERIM ORGANIZATION
for
INFORMATION & COMMUNICATION MGMT. (ICM)

as presented to the Senior Executive Committee
December 1982

FIGURE A-4



INITIAL ORGANIZATION
for
INFORMATION MANAGEMENT

as proposed by "A" Directorate and
agreed to by "R" and "V" Directorates

(c) Develop and maintain policy, procedures, and practices that will affix accountability for information systems cost and value and promote awareness of information as a costly and essential resource.

As a Canadian Police Service to the Police Community to provide electronic data processing and telecommunications services through the facilities of the Canadian Police Information Centre and through technical and consulting assistance for operational police systems.

APPENDIX III

A case study in the electronic office

The Excise Branch of Revenue Canada Customs and Excise has been collaborating with Bell Northern Research, Northern Telecom Limited and Bell Canada to test next-generation electronic office communications equipment and systems.

The following report by Jim Commins, manager of the BNR Field Trial Project, appeared as a special issue of Contact (March, 1984) under the title, "Excise Looks at the Electronic Office." With the kind permission of Mr. Commins, it is re-printed here to give readers an insight into one department's first-hand experience with the converging technologies in terms of the electronic office.

Origins of the Project

The BNR field trials are a test stage in the development of a uniquely Canadian approach to office systems design. These trials are sponsored by the Office Communications Systems Program of the Department of Communications. BNR's system is called the Integrated Services System (ISS) and is designed primarily to facilitate communications. The Excise project is not focused on automation, but rather on how "knowledge workers" at various levels can use new electronic technology to improve their effectiveness through better communications and access to information. In other words, we are not dealing with data processing or automation so much as with speeding up the personal handling of voice and written information. It's an important difference.

We are participating in the BNR trial because some form of electronic office is part of Customs and Excise strategy for the 80's. Like other technologies in the past, the microprocessor will change the nature of work. We bid for this project. We regard it as a practical contribution to Canadian business development and an experience that will put Customs and Excise in a lead position in public administration within a decade.

Preceding the field trial of the ISS equipment was a year of planning studies funded by the Department of Communications. BNR's analysis of our needs pointed to the Excise managers in general - and tax interpretation in particular - as fruitful participants. This was mainly because of their continuing day-to-day need to communicate with each other and to respond to requests for Excise tax information. Key question: can Excise become more proficient in its work and more effective in serving its various clienteles in the business community by speeding up office communications? A second important question: can the people in the department respond to the stated opportunity by incorporating the new electronic methods into their daily tasks? Finally, will the equipment and programs satisfactorily meet the requirements of Excise?

For instance, Tax Interpretations

Although many of the managers in Excise will be "on line" with one of the hundred or so ISS work stations, the tax interpretation function is the centrepiece of the BNR field trials. The Excise Tax Act has to be interpreted by this office for tax rulings. In the past, the branch has used typed ruling cards to record decisions on taxpayers' status with respect to specific commodities. For example, the conditions under which large tires for off-highway vehicles are designated as tax exempt on the grounds that they are used as parts for construction equipment.

The department has recently put these rulings - several thousand of them - into the QUIC/LAW computer utility in Kingston, Ontario. The file can be searched by "key words" to find relevant past rulings. ISS will enable more people to do this directly, to confer by telephone on problems of interpretation while viewing the text of a ruling on a video terminal. Tax interpretation officers will also be able to readily extract rulings from the computer file for use in answering enquiries from the public. Although this service is at the testing stage, tax interpretation officers have been using ISS to prepare their case correspondence and to communicate with each other electronically through the messaging service.

The same idea of getting information quickly, being able to create it, discuss it, write electronic memos and create computer files - all this is also available for use by several of the managers in Excise not directly involved in tax interpretation decisions. So - how does ISS do it?

The Integrated Services System (ISS)

The system is made up of user work stations, which are combined terminals and telephones, a telecommunications network using electronic switchboards on our premises and a computer located in Toronto which contains the programmed services and the users files or workspace. The BNR field trial, from the companies' standpoint, reflects standard practice in "concept testing" prior to the making of major decisions on product development. In our case, the testing is being carried out on an unusually large scale. We benefit from this in that we have the chance to monitor the way that people and organizations react to "electronic ideas." The field trial has strong focus on ALL the interfaces between human beings and technology.

Let's go back to the system itself. Each user can access the computer through the electronic switchboard for various services such as word processing, electronic mail, retrieval of stored information (see next section). Because everyone is sharing the same computer, information can be readily directed from one user to another. It can also be printed on a nearby printer similar to a word processor printer. This is not unusual in terms of computer-based communications. However, the electronic switchboard can switch both voice and data messages simultaneously. This permits "conferencing" between up to six users - where they can discuss a document appearing on each of their video terminals. The document may have come from the computer storage files or from some outside data base, such as QUIC/LAW. ISS users thus have a sort of "window on the world" at their disposal - getting information, creating and storing it in the computer, sending and receiving messages, discussing text and numerical data, and making and recording Excise decisions.

In the test, Excise headquarters in Ottawa has 52 Displayphones or similar devices, and the branch's Toronto region 48, or 100 altogether. The printers are similarly distributed, 6 at headquarters and 7 in Toronto. The inclusion of Toronto adds a long-distance dimension to the field trials and helps define regional communication needs; in future, all regions might be similarly equipped if the field trials yield positive results.

ISS Service Features

An advanced telephone system permits ISS users to store phone numbers, dial them automatically, transfer and hold calls; carry on hands-free conversations, and so on. All the information flows, whether verbal or digital, are carried on this telephone network. Users can of course make long-distance calls through the outside Bell Canada system, just as they have always been able to do.

Electronic mail is another ISS service. Users can use their terminal keyboards to compose and exchange written messages at very short intervals as compared with inter-office mail of the traditional kind. One originator of a message can direct it simultaneously to several recipients. These messages may be "original" or contain information from either the central computer file or an outside data bank such as QUIC/LAW. The computer's word processing program permits ISS users to edit their draft copy on their Displayphone screen before sending the message; or, the system can be instructed to file the information for future use.

ISS offers combined finding and filing services. Users can search for information when they are not quite sure what they are looking for - such as letters they may have sent to a specific class of taxpayer, or letters referring to a specific subject. Electronic files can be created to store information in exactly the same way that manilla folders are set up to contain documents in a filing cabinet. If messages or other documents are printed as hard-copy records, they go into one of these traditional paper files.

We have already mentioned the conferencing capability of the ISS. A conference between 2 to 6 users can be set up by any user. All the conferees can view the same document at the same time, and discuss it together on the telephone. The document being viewed can be changed by any conferee at the discretion of the chairman. Or, other documents can be called to the screens. Participants can drop out of the conference for a few moments if they wish, to select additional computer stored information having a bearing on the conversation underway - and then rejoin it.

In addition to its "messaging" and "conferencing" features. ISS also offers peripheral services to its Excise users. A telephone directory, for example. A calendar for setting up meetings or on-line conferences. An electronic calculator for mathematics. Electronic forms, which can be handled in the same way as electronic mail.

ISS is a prototype of systems to come. Eventually, we can look forward to the linking of ISS-type systems in different organizations. This could mean a vast interdepartmental or public audio-visual communications system covering all of Canada or even the whole world. This is some years away, of course, but the trend is already visible. For example, the installation of computerized switchboards by the Government Telecommunications Agency is now in process. The next three years will see most government offices in Canada able to install advanced communications systems using the telephone wires already in place.

Purposes of the Field Trial and Evaluation

The ISS field trial in Excise is designed to serve the needs of the three main parties to the contract. The Department of Communications and the government in general is interested in the demonstrable potential of the Office Communications Systems program for stimulating Canadian industrial development. Bell and its partners are testing prototypes of products and equipment for the electronic office. Customs and Excise is assessing how such equipment affects the productivity and effectiveness of departmental operations. All parties are interested in the answers to a number of questions.

First, do the ISS components work properly? Do they break down or stand up under continued use? What features are most useful? Which components need to be modified or replaced in future generations of such equipment?

Second, how useful is ISS to the Excise Branch, in tax interpretation and management in general? What does the degree of success - or lack of it - imply for the department's future plans for the application of electronic technology in communications?

Third, what about the people? How do people react to these new items of hardware and software? How do they feel about them? Are the systems easy to use? The department is deeply concerned with these and other issues of user-friendliness in computer-related equipment.

Finally, and this is a critical point for the suppliers, how marketable would future generations of ISS-type equipment be, in applications such as those encountered in the Excise branch test?

Departmental Expectations

The Customs and Excise Department is looking for indications of the size of potential future pay-offs from ISS type equipment. We simply must become more efficient in our office work. Thus the BNR field trials should help us judge what is feasible in advanced office communications systems for C & E operations and also what rate of change people can absorb without it affecting them adversely.

Overall, we expect our experiences to provide a foundation for departmental leadership in public administration in the 1980's and beyond. The critical measures of the electronic office and of those who work in it are higher productivity, increased effectiveness and better service to the public.

APPENDIX IV

Reading guide

Bélanger, Marc. The Facts, The New Electronic Canada. (Volume 5, Number 7.) Canadian Union of Public Employees (CUPE), September, 1983.

A special issue of CUPE's regular membership magazine. Reviews the new information and communications technologies and examines from the labour perspective their impacts on health, safety, employment and society as a whole.

Current Trends in Major Telecommunications Technologies. Communications Div., Carrier Policy and Research Office, Ontario Ministry of Transportation and Communications, Sept. 1984.

An Ontario government report addressing state-of-the-art developments. Written for a non-technical audience, this paper is intended to be an informative reference on the applications of new communications technologies from a user perspective.

Five-Year Plan: Meeting the Automatic Data Processing and Telecommunications Needs of the Federal Government. Washington, D.C.: Office of Management and Budget, April 1983.

The basic purpose of this document is to serve the planning needs of its various readers: by showing the federal agencies what technologies and services are likely to be available over the next several years so that they can create a more detailed programmatic strategy for taking advantage of them; by providing the central management agencies and the congress with a comprehensive view of both future technologies and the needs of the agencies so that they can integrate the two in the most effective way; and by giving the market place providers of technology and services an early indication of federal needs so that they can plan to meet them through open competition.

L'informatique aujourd'hui, Le Monde. Paris, 1982.

A collection of the articles published in the newspaper, Le Monde, on the subject of information technology. Topics include the technologies, policies, applications and impacts, as well as a glossary and bibliography of French language documents.

Marsh, Ken. The Way the New Technology Works. New York: Simon and Schuster, 1982.

Clear, simple, illustrated descriptions of the technologies of today - how they work, what they do and how they are changing our lives. Comprised of three parts: Some Basics, Telecommunications and Automatic Information Processing. This book is both technically comprehensible and attractively written for non-experts.

Menzies, Heather. Women and the Chip: Case Studies of the Effects of Information on Employment in Canada. Montreal: Institute for Research on Public Policy, 1981.

Naisbitt, John. Megatrends. New York: Warner Books, Inc., 1982.

A view of the future in terms of where technology is leading society. Updated in 1984 and made available in paperback.

Organizational Trends in Informatics, Task Force on Informatics, Treasury Board of Canada Secretariat, November 1984.

A study paper based on an intensive review of a large volume of current literature on the subject of informatics and a survey of nine federal departments and agencies and twelve private sector organizations that are significant users of informatics technology. Its purpose is to identify features of organizations common to those enterprises which have adopted and integrated informatics technology successfully. Knowledge of what has worked for others should be of use to managers who are presently or are about to be engaged in reorganizing informatics within their departments and agencies.

Peitchinis, S.G., Ph.D. The Employment Implications of Computers and Telecommunications Technology. Calgary, Alberta: The University of Calgary, April 1981. Available from DOC Library, P.91 C655, P.45, 1981.

Report of a study funded by the Department of Communications, Labour Canada and Employment and Immigration Canada.

Proceedings of a Conference on the Impact of Micro-Electronic Technology on the Work Environment. Ottawa: Labour Canada, 1981.

Organized by the Women's Bureau, Labour Canada, national and international experts met at a conference in Ottawa to discuss the impact of micro-electronics on issues related to research and development, employment and training and the office of the future, and, secondly, to begin to assess the impact, positive and negative, on labour-management relations to identify possible strategies designed to minimize adverse consequences.

The Interconnect Industry in Canada: 1984. ICA Telemanagement Inc., 2175 Sheppard Ave. E., Suite 210, Willowdale, Ont., M2J 1W8, (416)-494-4440.

Third annual survey of the Canadian interconnect industry. Provides a profile of the interconnect industry, its size, composition, delineating practices and characteristics, and its share of the telecommunications market. Also provides details on the top firms in the industry, including their strategies and perspectives; describes the response of the telephone companies to interconnection; and outlines the new developments to be expected in the future.

Trends in Informatics Technology. Task Force on Informatics, Treasury Board of Canada Secretariat, November 1984.

A study paper based on a review of literature and on studies sponsored by the Task Force. This paper reviews and assesses the dramatic changes which are occurring in the computer and telecommunications technologies and touches in the expected impact of these technologies on the office and on office automation.

APPENDIX V

Glossary of abbreviations

AES	Atmospheric Environment Service
AMI	Automated Master Index
BAM	Bus Access Module
BNR	Bell Northern Research
BPS	Bits per second
CAD	Computer-Aided Design
C&E	Customs and Excise
CCITT	International Telegraph and Telephone Consultative Committee
CIIDS	Computerized Integrated Information Dispatch System
CPDL	Canadian Patents and Development Limited
CPI	Computer-to-Private Branch Exchange Interface
CPIC	Canadian Police Information Centre
CRC	Communications Research Centre
CRTC	Canadian Radio-Television and Telecommunications Commission
CS	Certification Standards
CSA	Canadian Standards Association
CUPE	Canadian Union of Public Employees
DDD	Direct Distance Dialing
DND	Department of National Defence
DOC	Department of Communications
EDP	Electronic Data Processing
EEWD	Enhanced Exchange Wide Dial
EOS	Electronic Office Systems
FO-LANs	Fibre Optic Local Area Networks
FUNDI	Functional Diagnostic
FY	Fiscal Year
GISN	Government Integrated Services Network
GTA	Government Telecommunications Agency
ICM	Information and Communication Management
ISDN	Integrated Services Digital Network
ISS	Integrated Services System
ITSP	Information Technology and Systems Plan
IX	Inter-City
KBS	Kilo bits per second
LANs	Local Area Networks
LSDS	Low Speed Data Services
MOSST	Ministry of State for Science and Technology
MSAT	Mobile Satellite
NASA	National Aeronautics and Space Administration
NRC	National Research Council
OCRA	Office Communications Research Associates
OCS	Office Communications Systems
PABX	Private Automatic Branch Exchange
PAR FOUR	Planning, Accounting and Reporting for Operational Use of Resources
PBX	Private Branch Exchange

PC	Personal Computer
PIRS	Police Information Reporting System
PRAI	Project Research Applicable in Industry
PSTN	Public Switched Telephone Network
R&D	Research and Development
RCC	Radio Common Carriers
RCMP	Royal Canadian Mounted Police
ROSS	RCMP Office Support System
SCOT	Steering Committee on Telecommunications
SCPC	Single Channel Per Carrier
TAC	Telecommunications Advisory Committee
TAPAC	Terminal Attachment Program Advisory Committee
TC	Transport Canada
TDMA	Time Division Multiple Access
TMM	Telecommunications Management Manual
TWX	Teletypewriter Exchange
VDUs	Video Display Units